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Vol. 22 NOVEMBER, 1936 No. 11

# International Journal of Orthodontia and Oral Surgery

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# *International Journal of Orthodontia and Oral Surgery*

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Vol. 22, No. 11, November, 1936. International Journal of Orthodontia and Oral Surgery is published by The C. V. Mosby Company, 3523 Pine Blvd., St. Louis, Mo. Subscription Price: United States, its Possessions, Pan-American Countries, $7.00; Canada, $7.50; Foreign, $8.50. Entered as Second-Class Matter at Post Office at St. Louis, Mo., Under Act of March 3, 1879.

International
Journal of Orthodontia
and Oral Surgery

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VOL. 22 NOVEMBER, 1936 No. 11

## Orthodontia

### RÔLE OF THE MUSCLES OF MASTICATION IN PRODUCTION AND CORRECTION OF MALOCCLUSION

LAWRENCE J. OBREY, D.D.S., BOSTON, MASS.

MANY of the fundamental aspects of orthodontia have been long in coming to the surface, and having come are long in being recognized. Of paramount importance are the muscles of mastication. These muscles are the masseter, temporal, internal and external pterygoid.

It might be well to review the importance of their origin, insertion, and action. The masseter is made up of a strong quadrate sheet consisting of two distinct layers extending from the zygomatic arch to the mandible. The superficial layer rises from the lower border of the malar bone and from the anterior two-thirds of the zygomatic arch. Passing downward and backward it is inserted into the outer surface of the ramus of the mandible. The deep layer passes downward and slightly forward and is inserted into the upper half of the ramus of the mandible. The action is to draw slightly forward, and, by its superficial layer, to close the jaw. In closing the jaw it acts with less mechanical disadvantage than is usual with muscles. When the pressure to be overcome is exerted upon the back teeth, the arm of the lever upon which the power acts is almost as long as that which intervenes between these teeth and the fulcrum. This fulcrum is not at the temporomandibular joint, but at a point below the neck of the mandible, corresponding very nearly to the lower attachment of the internal lateral ligament. Moreover, the resultant force of the muscle, acting as it does upward and forward, is perpendicular to the lever, which may be roughly described as a bar extending downward and forward from the neck of the mandible to the point of the chin. In this muscle and the temporal we have a living orthodontic appliance of great efficiency and function, which will be taken up later. The masseter muscle lies deeply in contact with the ramus of

the jaw and the buccinator muscle, being separated from the latter by a layer of fat. A small portion of the temporal muscle comes into relation with the deeper lying portion.

The temporal muscle is covered by a strong membrane—the temporal fascia—which rises from the temporal ridge and is inserted into both inner and outer portions of the upper border of the zygomatic arch. Near this point it divides into two distinct layers, one passing to the inner, the other to the outer margins of the zygoma. Passing downward from this to the inferior borders of the ramus of the jaw, it envelopes the masseter muscle. The muscle itself is radiating and fan-shaped in form, located in the temporal fossa from which point it descends to the coronoid process of the mandible. The action of the temporal is to close the mandible, some of its fibers drawing the jaw backward after the other muscles have protruded it.

The internal pterygoid muscle is a thick, quadrilateral, sheetlike muscle and receives its name from its origin and relative position. It originates from the external pterygoid plate, the tuberosity of the palate bone and a small portion of the maxilla. It inserts into the internal surface of the ramus of the mandible at its lower and posterior borders and extends as high as the mandibular foramen and mylohyoid. Its action is to close the jaw and at the same time draw it backward and throw it toward the opposite side. The same observations which were made with respect to the very small loss of the mechanical advantage in the masseter muscle apply to this muscle. When closed it will draw the jaw forward, and it will also help the external pterygoid in drawing the ramus of its own side toward the middle line.

The external pterygoid muscle is composed of two triangular sheets, one passing in a horizontal and the other in a vertical direction. It receives its name from its attachment to the pterygoid process of the sphenoid bone, as well as its relation to its companion muscle, the internal pterygoid. It originates from two distinct heads—an upper and a lower. The upper head rises from the greater wing of the sphenoid bone, from the internal pterygoid ridge, and externally to the foramen ovale and foramen spinosum. The lower head rises from the outer surface of the external pterygoid plate. The upper head is inserted into the interarticular fibrocartilage, in the capsule of the joint, as well as the neck of the condyle. The lower head is inserted into the neck of the condyle. The action of the external pterygoid muscle is to draw the condyle and the interarticular fibrocartilage forward and inward. The combination of these two movements produces the oblique movement of the mandibular molar teeth of one side forward and inward, with respect to the maxillary molars which are their opponents. This inward movement of one side is the agent by which the ramus of the opposite side is moved outward to assist in opening the mouth by depression of the mandible. As the transverse axis of this movement passes through the mandible at two points situated below the necks of the rami, it follows that a forward movement of the condyles and necks will assist in the backward movement of the angles and body which accompanies the depression of the mandible.

This thesis is based solely upon this small group of skeletal muscles whose structural arrangement and mechanical action are based upon a common plan,

and are to be understood as masticatory and facial, so far as they play a very important rôle in the production and correction of malocclusion. They may be either atonic or malactic, and by their action in their respective forms they may cause a serious malocclusion or, through proper and intelligent use, be an important factor in the correction of this condition.

Embryologically, the cells of these muscles are long, narrow, and striated. They differ somewhat from the other muscles of the body, and in differing in structure they differ in function. *The principal difference is that the striated muscle is under direct control of the central nervous system. Each one of these muscles is made up of a number of fasciculi, arranged in such a way as to give form corresponding to the function of that particular muscle. They are essentially organized as the agents of motor activity when nervous, vascular, and lymphatic systems are considered. Each muscle is generously supplied with nerve tissue which, after entering, separates into smaller branches until it terminates in small fibers in each muscle cell.

Physiologically, the properties of these muscles are their irritability, contractility, elasticity, and tonicity. It is now evident that with the proper stimuli they may aid in the correction of a malocclusion caused by an improper stimulus, or in a case in which there is no stimulus or function.

Stimuli are furnished by action of the nerve impulses transmitted by nerves from the central system to the muscles. Each impulse is under direct control of the will.

Since the bone of the mandible and maxilla is of a plastic nature, it can be seen that a pressure, whether normal or abnormal, could stimulate growth which might in due course cause the movement of teeth in malrelation to each other or to the opposite arch. It follows that an overexerted pressure could prevent lateral development of the arches.

In a distoclusion case we may look to the pterygoid group of muscles. Their lack of stimulus in replacing the mandible to its normal position may be the important etiologic factor of this malocclusion. In the same breath we may say that with careful instructions and proper stimuli this condition may be entirely corrected by these same muscles. These pterygoid muscles can be trained to place the mandible in its normal position, provided, of course, there are no interferences. This is more successful in younger children before the glenoid fossa has taken such shape as to discourage the pterygoid muscles. These muscles may be regarded as the intermaxillary elastics of nature, and when trained will perform an accurate function with results of unusual merit. An exercise may consist of placing the mandible as far forward as possible and holding it there for ten seconds, this being repeated as many times as the nature of the case requires.*

These muscles of mastication may cause a malocclusion through lack of function, tonicity, elasticity, stimuli pressure and correlation. Overactivity of the pterygoid muscles could cause a protrusion of the mandible, Class III, and a retruding of the maxillary teeth with abnormal development of the maxillary arch. Pressure or lack of tonicity in any given area may cause a lack of development or an overdevelopment.

*Dr. Alfred Rogers.

In the masseter temporal group we have a living orthodontic appliance of great efficiency, and its function in this rôle is not only developmental in character but also retentive. With the use of these muscles under the proper circumstances and under skillful direction, it is possible to develop either the maxillary or the mandibular arch. With this orthodontic appliance it is also possible to assist in the correction of infraclusion occurring in either the anterior or the distal portion of the dental arches. It is also possible to correct distoclusion, and further to act as a retentive measure preventing the recurrence of distoclusion. To our advantage we have established full efficiency of the function of mastication and not a mechanical one as when accomplished by mechanical means.

After the patient is able to place the teeth in proper relation, the following exercise can be given: Hold the teeth firmly in occlusion and alternately contract and relax this group of muscles.*

The muscles of mastication are machines in many respects like those which are employed to do our work, and with the advantage that they need no looking after. They do not have to be constructed or applied for they are already in relatively correct position; they improve in efficiency with intelligent performance and stimulate tissue growth; they move slowly but are capable of tremendous force. However, if these muscles of mastication be atonic or malactic, their rôle is toward a malocclusion, but if physiologic in their intelligent stimuli, they can play a leading rôle in the correction of malocclusion.

It would be wrong to believe that the muscles of mastication alone can correct every case of malocclusion; for in many cases, if not in the majority, the etiologic basic or underlying cause is interference in one or more places in either or both arches. This must be eliminated with an orthodontic appliance. The ease and the ultimate success with which these causes are eliminated depend upon the ingenuity and skill of the operator. He should be especially trained in both the construction and the manipulation of these delicate appliances, as well as in intelligently conveying to the patient the exercises which will restore the physiologic control of these muscles, that they in turn may play their part successfully in aiding and restoring a well-functioning occlusion.

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*Dr. Alfred Rogers.

# ETIOLOGY, DIAGNOSIS, AND TREATMENT OF CLASS II DIVISION 1 MALOCCLUSION

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## DIAGNOSIS

ALTHOUGH etiology is usually placed first in a discussion of malocclusion, yet it would seem more logical to consider the diagnosis first. This gives a clear picture of the characteristics of the condition, with the varying modifications, which might be of assistance in discussing etiology.

There has been some question as to whether the term diagnosis can be applied in orthodontia, and the terms analysis and classification have been offered in its stead. Diagnosis means "determining the nature of a case of disease." Malocclusion is not a disease but rather a condition of malformation or abnormal development. Diagnosis could then be defined as a "determination of the existing dentofacial condition." It does not involve any consideration of the etiology of the condition or of the treatment necessary for its correction. An accurate diagnosis is an essential prerequisite to successful treatment. In order to make a diagnosis it is necessary to observe and analyze the signs and symptoms present and by means of these to place the condition in a general group having similar main characteristics. Whether this general grouping is indicated by name or by number is not of real serious import, and in medicine such diseases as pneumonia and tuberculosis are divided into numerical types. Hence a diagnosis of a case of malocclusion implies both an analysis and a classification or designation of the condition.

In the practice of medicine diseases are diagnosed both by subjective symptoms on the part of the patient and by objective symptoms or signs as observed by the physician. In orthodontia it is only occasionally that the patient seeks advice and treatment because of subjective symptoms, such as disturbed masticatory efficiency or adverse reactions on personality make-up. Usually the patient complains of the objective appearance. The dentist or the orthodontist recognizes a developing or fully developed abnormality of the teeth and dentofacial area mainly through the observation of objective symptoms or signs. Such symptoms are concerned with the occlusion of the teeth of the maxillary and mandibular arches, the arrangement and position of the teeth within each arch, the relation of the alveolar arches to the bones on which they are placed, the relation of these to the skull, and the associated harmony or inharmony of facial features. The degree to which any or several of these vary from the normal or accepted standard is the extent to which the abnormality exists. What constitutes the normal is a question beyond the scope of this discussion, but it may be granted that the ideal occlusion serves as a satisfactory basis with which to start.

Presented before the American Society of Orthodontists, St. Louis, Mo., April 20-23, 1936.

A diagnosis based purely on observations of the above nature is incomplete, for, except in the case of adults, we are dealing with immature or growing individuals. As such, their stage of development and rate of growth must be taken into consideration, as well as their present physical state and their physical progress from infancy on.

In order to make a diagnosis, plan the treatment and make some appraisal of the possible etiology, certain requirements are both necessary and helpful. The first essential is a good set of plaster casts. Both a profile and a front view photograph, taken at a definite distance and in a standardized procedure so as to give photographs of the same relative size, are necessary for a study of the facial lines. A record of information elicited from the parent relative to the family history and to the patient's history is advisable. Such information should include the history of malocclusion in the family, the patient's full history as to both previous and present feeding, health, growth, development of the dentition and loss of teeth, habits of all kinds including customary method of breathing. In addition, there should be noted such observations as the operator may make on the development and tone of facial musculature, habits, posture, oral health, general development, and stature. This information is necessary for an intelligent appraisal of the patient with reference to prognosis and treatment. Intraoral and, if necessary, extraoral radiographs are essential in deciduous and mixed dentitions to ascertain the presence or absence of permanent teeth. Profile view x-ray pictures if taken with a standardized technic such as that developed by Broadbent are extremely valuable.

This presentation is concerned with that type of malocclusion known as Class II Division 1 to which certain symptoms have been ascribed and of which a definite picture has, heretofore, been built up in our minds. Class II Division 1 comprises all those conditions of malocclusion in which the mandibular arch is distal to the maxillary arch in its occlusal manifestation to the extent of more than half the width of a cusp but more usually the full width of a cusp or bicuspid and the maxillary anterior teeth are in labioversion. As Angle originally stressed, it is a distal or posterior relation of the mandibular arch and not of the molars only. The normal mesiodistal relation of the first permanent molars or "key to occlusion" is used as a guide from which to judge the abnormality. The syndrome was completed by the following: narrow maxillary arch, underdeveloped mandible, distal or posterior position of the mandible, underdeveloped mentum, short upper lip, thick lower lip, underdeveloped alae of the nose, mouth-breathing and associated abnormal muscular development.

A syndrome of this kind is fairly complete and easily recognized and has become the classical picture of Class II Division 1. Cases with the above symptoms are easily placed in this class. A method of treatment for this division has been developed on the basis of the classical syndrome.

The diagnosis of Class II Division 1 is, however, not so simple a process as the classical picture of symptoms seems to convey. This picture is drawn from the advanced cases, and not all cases have progressed to that extent nor are some of the symptoms well defined. The "key to occlusion," which is the

guiding landmark in the Angle classification and is based on the so-called constancy of the maxillary first molar, may sometimes be misleading. The constancy of the maxillary first permanent molar is no longer accepted as such. Because of the premature loss of the maxillary deciduous molars the

Fig. 1.

Fig. 2.

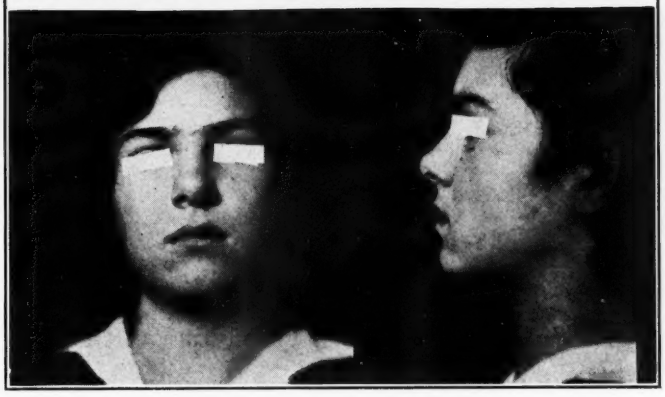

Fig. 3.

Fig. 1.—True Class I case presenting appearance of Class II resulting from early loss of maxillary deciduous molars.

Fig. 2.—True Class I condition. Apparent distal relation of mandibular posterior teeth due to mesial drift of maxillary posterior teeth.

Fig. 3.—Photographs of patient in Fig. 2. Facial lines well balanced.

first permanent molar may drift mesially and present an apparent Class II case (Fig. 1). This type of condition can be recognized as belonging to Class

I particularly by the mesiodistal relation of the first bicuspids. A careful analysis of the malocclusion shown in Fig. 2 shows with the help of the photographs (Fig. 3) that all the maxillary posterior teeth have drifted mesially. Class II is again excluded, especially Division 1, and this case is placed in Class I.

Possible rotations of the first permanent molars must always be kept in mind, for when they occur the normal relation of the mesiobuccal cusp and buccal groove is disturbed and may be misleading. In such a condition the occlusion of the mesiolingual cusp of the maxillary first molar in the central fossa of the mandibular first molar is a more important and better guide.

Fig. 4. Fig. 5.

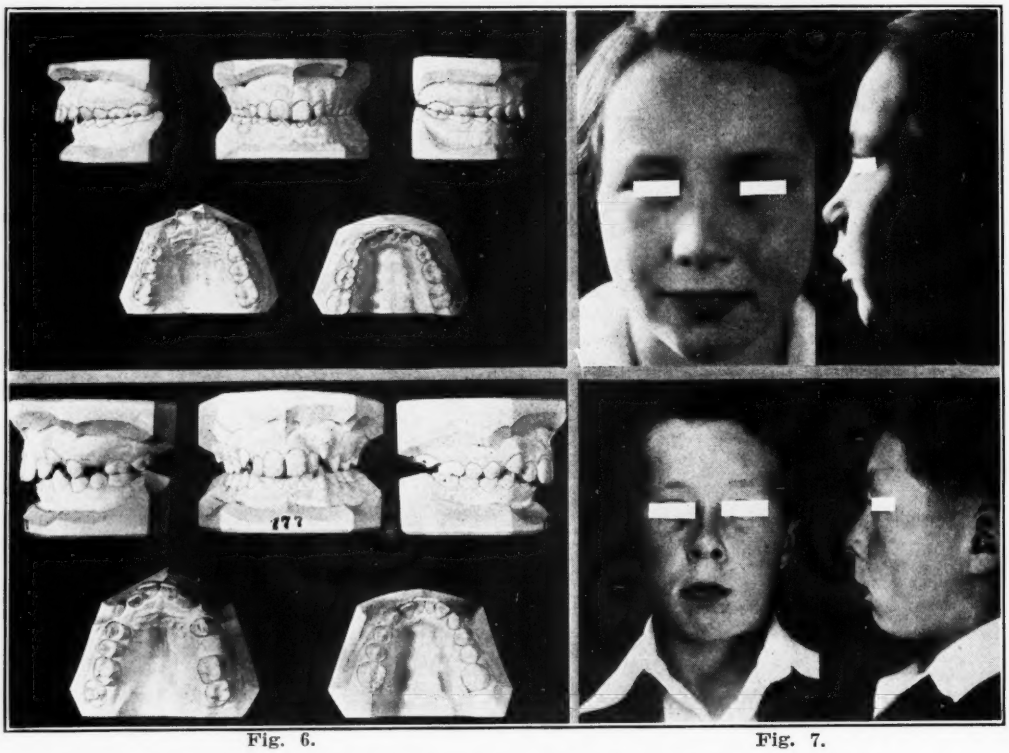

Fig. 6. Fig. 7.

Fig. 4.—Class II Division 1 case with symptoms not definite to differentiate it from Division 2.

Fig. 5.—Photographs of patient in Fig. 4. Facial lines are akin to those seen in Division 1.

Fig. 6.—Case bordering between Division 1 and Division 2 of Class II. Diagnosed as mild Class II Division 2.

Fig. 7.—Photographs of patient in Fig. 6. Note underdeveloped mentum and well-developed upper lip.

The symptom which differentiates Division 1 from Division 2 is the protrusion of the maxillary anterior teeth. The distinction between them has been made clear-cut and supposedly well differentiated. Actually, there are cases which verge on the borderline between the two divisions, and a diagnosis as to which division the case is to be placed in becomes extremely difficult.

A case of this type is seen in Fig. 4. There is only a slight labioversion of the central incisors and also a slight linguoversion of the lateral incisors. With the aid of the photographs (Fig. 5) this case was placed in Division 1.

Fig. 6 shows a case presenting a similar difficulty in diagnosis. There is an apparent labioversion of the maxillary central incisors, although the vertical axis of these teeth does not indicate this. The lateral incisors are in linguoversion, while the cuspids are erupting in labioversion. The photographs (Fig. 7) are not of a great deal of assistance, as the well-developed upper lip is associated with an underdeveloped mentum, the former supposedly a symptom of Division 2 and the latter of Division 1. This case was finally diagnosed as a mild Division 2.

Careful analysis of those cases that are diagnosed as belonging to Division 1 because of the labioversion of the maxillary anterior teeth shows that only some of them conform to the classical picture of this condition. There is a great deal of variation in the extent of the labioversion and in other important aspects of the syndrome. Some cases hardly resemble the typical, and the question arises whether, from the point of view of treatment, a further grouping within this division is not desirable.

## TREATMENT

The general method of treatment of Class II Division 1 may be considered at this point. Ultimately, treatment is guided by the objective in view. That objective is to restore as far as possible the normal positions of the individual teeth, the normal shape of the dental arches, and the normal occlusal relationship of these arches and to correct whatever inharmony of facial features there may be present intimately associated with the malocclusion and amenable to correction by orthodontic treatment. Treatment depends not only on an accurate diagnosis of the dentofacial irregularity but also on a physical appraisal of the patient and of the tissues involved in the treatment. In addition, treatment may be modified by the developmental stage of the dentition, and consideration must be given to possible etiologic factors.

As a general rule, treatment is indicated as early as the condition is manifestly developing or already established and the necessary cooperation of the patient is available. Class II Division 1 is progressive in its development, and the sooner in the development of the patient that it is corrected, the sooner will be available whatever beneficial effects normal occlusion has on the growth of the face. At least some attempt is thereby made to prevent further development of the facial inharmony, thus justifying any consequent increase in the duration of the treatment. In many cases mouth-breathing is concomitant. This cannot be overcome by the patient because the protrusion of the maxillary incisors and the position of the mandibular arch will not permit an easy closure of the lips. Provided the nasopharyngeal obstruction has been removed, early treatment is of decided benefit in such cases, for then breathing through the nose is made possible and normality is established in that respect.

The objective in treatment being to restore the normal mesiodistal relation of the arches and the mandibular arch being distal to the maxillary arch, two methods have been advocated for attaining this objective. In the one, the maxillary posterior teeth are tipped distally either individually or en masse and the mandibular arch is moved mesially, the discrepancy of one cusp being

overcome that way. This procedure requires further justification, for it is contrary to the known direction of growth of the maxilla. That direction is a forward one to allow for the successive eruption of the second and third permanent molars. To move the first permanent molar and bicuspids distally is to enforce a handicap on the growth forces and to invite the possibility of relapse should growth reassert itself to the full. If this does not occur, then there is the possibility of impacting the third molars, which would require their surgical removal at a later stage. The other procedure involves the mesial movement of the mandibular arch to the full extent of its displacement. The treatment is then in conformity with the normal direction of growth.

The treatment of Class II Division 1 may be divided into four steps or stages, the first three of which are active operative treatment and the fourth is postoperative treatment. The four steps are:

First— Necessary expansion and alignment of both maxillary and mandibular arches and alignment of their individual teeth.

Second—Correction of the mesiodistal relationship of the arches.

Third— Correction of any excessive overbite and exaggerated curve of Spee.

Fourth—Retention.

These steps are used as a general formula, and strict adherence to them or to the limitation between them is not advisable in certain cases. Modifications of these steps and the blending or combination of two steps are governed by the demands of each case and will be considered with the different cases presented.

*First Step.*—Expansion of the maxillary and mandibular arches, where necessary, is considered as the first step because the contracted maxillary arch, especially in the cuspid region, interferes with the forward development of the mandible. Very often the removal of this occlusal interference alone will permit the mandible to develop, and some, if not considerable, improvement in the mesiodistal relation of the arches will be obtained without any other aid. As the mandibular arch moves in an anterior direction, it requires a wider maxillary arch for occlusion; hence the maxillary expansion is continued slightly ahead of that of the mandibular arch until the necessary width is obtained. At the same time any necessary rotations of cuspids and bicuspids and alignment of individual teeth may be accomplished.

If there is only slight labioversion of the maxillary incisors, this may be corrected at the same time. If there is a great deal of protrusion, then it is advisable to combine this part of the treatment with the second step.

The choice of appliances in the first step of the treatment is governed not only by the detailed conditions of the case but also by the developmental stage of the dentition at the time treatment is instituted. There are, of course, many types of appliances available, but only those will be considered which have been found most satisfactory in my hands. The efficiency of an appliance often depends on the skill of the operator, and equal results may be obtained with mechanisms not included here. The details of construction have been well covered in the literature and require no further review.

In the maxillary arch several types of appliances are used. In cases of older patients in whom the permanent teeth have erupted and in whom there is no spacing between the incisors, the mechanism favored is the half-round pin and tube appliance with bands on the incisors, the first bicuspids, and the first permanent molars. As the treatment progresses, bands are placed on the cuspids. If necessary this may be done at the beginning of the treatment. To avoid any rigid attachment to the teeth the flat surface of all the pins except the molar posts is ground slightly with a stone or sandpaper disk, and the rounded surface is gone over lightly with a file. This obviates a tight fit and permits a very slight movement of the pin in the tube. If the incisors are spaced, then this appliance is contraindicated at the commencement of treatment. In its place are used the McCoy open tube attachments with a simple labial arch of 0.036 gauge.

In some of the advanced cases a lingual arch is added to assist in the lateral expansion. As a general rule, owing to the morphology of the maxillary arch, the stress of occlusion and the frequently excessive overbite, the lingual arch used alone has not proved very satisfactory. As much as possible in the maxillary arch, it is used only to supplement the action of the labial arch.

In young patients, in whom the central incisors are in the process of erupting, or in incipient cases the junior pin and tube appliance is used with bands on the deciduous cuspids and second molars. A half-round tube is used on the cuspid bands instead of the two round tubes as originally devised by J. Lowe Young. The alignment and the lingual movement of the anterior teeth are postponed to a later stage.

For the mandibular arch, the lingual appliance with loops mesial to the molar posts has proved satisfactory in nearly all cases. But it is never used unless it is stabilized by means of accurately soldered staples on the lingual surfaces of bands on either the cuspids or the lateral incisors. Such stabilization is important, as it converts the arch into a unit and prevents any displacement of the appliance. If the wire is adapted to lie along the lingual surfaces of the incisors just above the apices of the interproximal gum tissue, tipping of the incisors does not seem to take place. Finger springs are used in conjunction with it when necessary.

*Second Step.*—When the arches have been expanded, the correction of the mesiodistal relationship is accomplished by the use of intermaxillary elastics. They extend from hooks soldered to the maxillary labial appliance in the cuspid regions to hooks soldered to the mesial half of the buccal surfaces of the bands on the mandibular first permanent molars. Elastics of different sizes are used depending on the force desired, larger ones being used at the beginning until the patient becomes accustomed to them. Where the maxillary incisors are spaced, the lingual movement of these teeth is accomplished at the same time by this elastic force. Where the maxillary incisors are in contact with each other but in considerable labioversion, the elastics are used to assist in the lingual movement in order to avoid any possibility of the maxillary

posterior teeth being moved mesially. If considerable lengthening of the mandibular arch is indicated, this is combined with the second step in order to reinforce the molar anchorage.

When the labioversion of the maxillary incisors has been corrected and sufficient improvement in the relation of the arches is obtained to permit closure of the lips without too much discomfort, the myofunctional therapy of Rogers is applied for the development of the musculature both of the lips and of the jaws. All nasal obstruction has, of course, been removed previous to commencing treatment, and normal breathing may now be insisted upon.

*Third Step.*—Treatment is next directed toward reducing the overbite, if necessary. The use of elastics as above with an additional attachment on the maxillary molars has not been found very satisfactory and has been discarded. In their stead the inclined bite-plane is used. The type found least irritating to the soft tissues is the filigree wire bite-plane constructed at an incline to assist in the further forward growth of the mandible. This is used with the labial appliance still in place and is wired to it in order to avoid displacement by the tongue and tipping of the molars.

*Fourth Step.*—The final stage is the postoperative treatment or retention. For the maxillary arch the removable vulcanite bite-plate of the Hawley type is used. The extent of the plane and its inclination is previously built up in wax on a base-plate and is checked in the mouth. A further opening of the bite may be obtained with this appliance, and the inclined plane maintains the established relation of the two arches. In mixed dentitions stabilization of this appliance is obtained by means of bands on the second deciduous molars with soldered lugs which catch the clasps. Similar means of attachment may be used on the first bicuspids or molars when these teeth are partially erupted or when their anatomic shape is not readily suitable for clasps. This appliance is worn continually for a period of about a year and then at nights only for such time as may seem desirable. This depends on the amount of expansion that was originally required and the difficulty experienced in correcting the mesiodistal relationship.

The mandibular anterior bands are removed, and the lingual arch is left in place to act as a retainer for some time. It is then replaced by a soldered lingual wire extending from cuspid to cuspid which is left on for about a year.

In Fig. 8 is seen what may be considered the more common type of Class II Division 1 case. The maxillary incisors are in considerable labioversion and the arch is contracted. The mandibular incisors are in normal alignment and their vertical axis is correct. The mandibular arch is shortened in its anteroposterior length from the premature loss of the deciduous molars. The permanent molars are rotated. The photographs (Fig. 9) show the characteristic facial inharmony. The mandible is distal to normal. There is very little development of the mentum, which slopes away toward the neck, accentuating its underdevelopment. There was a family history of malocclusion on both the mother's and the father's sides, and the father's chin was very similar in configuration to the child's. This child, aged nine years, gave a history of

bottle feeding after two months. There was no history of any pernicious habit except that she went to sleep on the bottle until one and one-half years old. There was evidence of some disturbance in the enamel formation of the molars but not of the incisors.

The result of the treatment is seen in Figs. 10 and 11. The lengthening of the mandibular arch resulted here in a slight tipping of the incisors. Recent examination of the patient has revealed no change in their alignment or in the occlusion.

Another familiar type of Division 1 case is seen in Fig. 12. The added complication in this case is the underdevelopment of both arches with insuffi-

Fig. 8. Fig. 9.

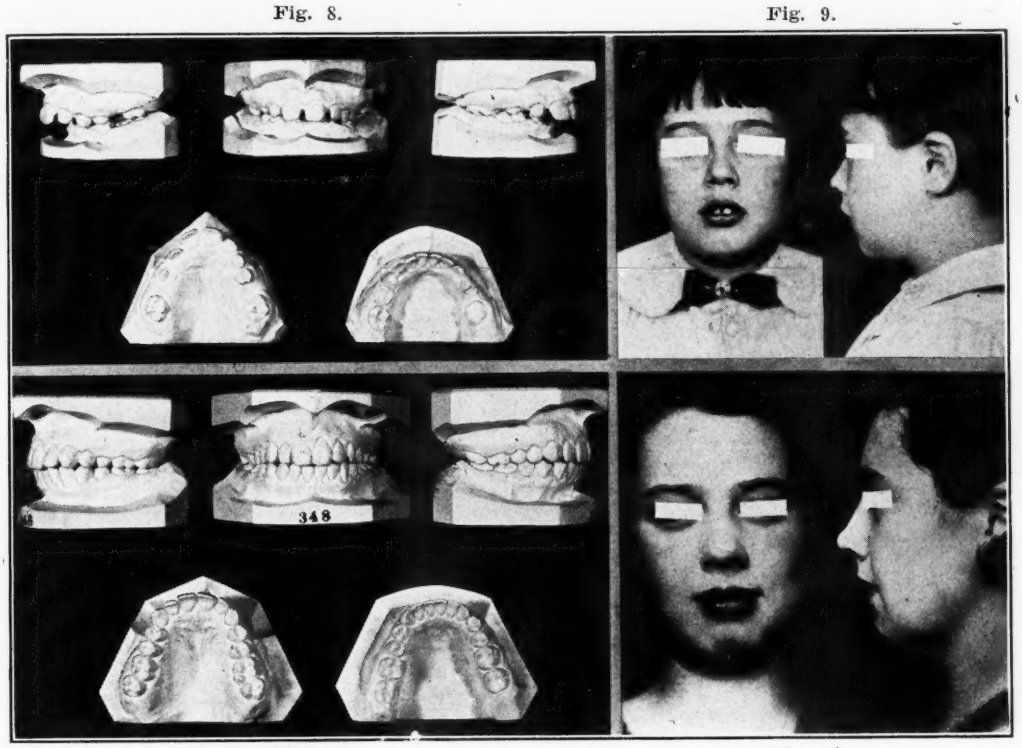


Fig. 10. Fig. 11.

Fig. 8.—Typical Class II Division 1 case.
Fig. 9.—Photographs of patient with malocclusion seen in Fig. 8.
Fig. 10.—Result of treatment of case in Fig. 8.
Fig. 11.—Final photographs after treatment of patient in Fig. 8. Compare with Fig. 9.

cient space for the normal eruption of the lateral incisors and their consequent malposition. Owing to the partial eruption of the incisors the overbite was not developed. The photographs shown in Fig. 13 complete the picture. The mentum is poorly developed with a very shallow mentolabial sulcus.

This patient was eight years eleven months old when treatment was commenced. She had been nursed for only six months and had not begun to walk until two years of age. Her skeletal growth was retarded, and as seen from the models the dentition was retarded as well. There was a definite history of thumb-sucking which was still being practiced occasionally. The patient's aunt and cousins had malocclusions resembling this one.

The expansion of the arches was accomplished by lingual appliances. On the full eruption of the incisors a pin and tube appliance was placed on the maxillary arch. Fig. 14 shows the occlusion five years after the removal of all retaining appliances.

The photographs show an interesting development. The ones seen in Fig. 15 were taken on the removal of all retainers. There appears to be a slight

Fig. 12.

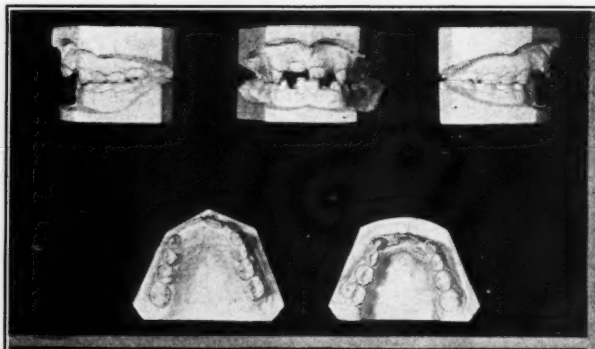

Fig. 13.

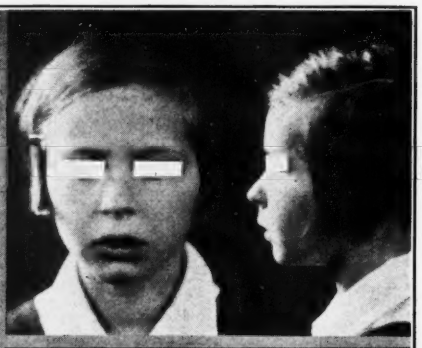

Fig. 14.

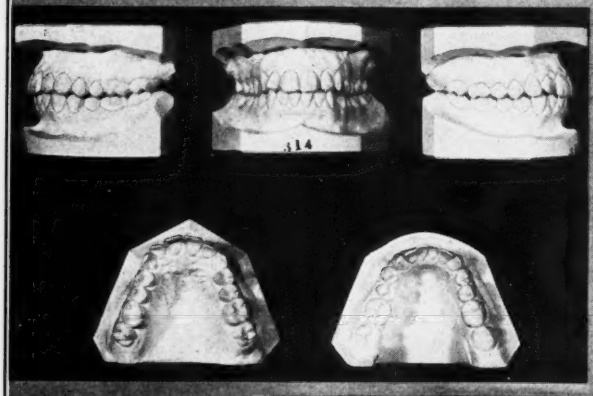

Fig. 15.

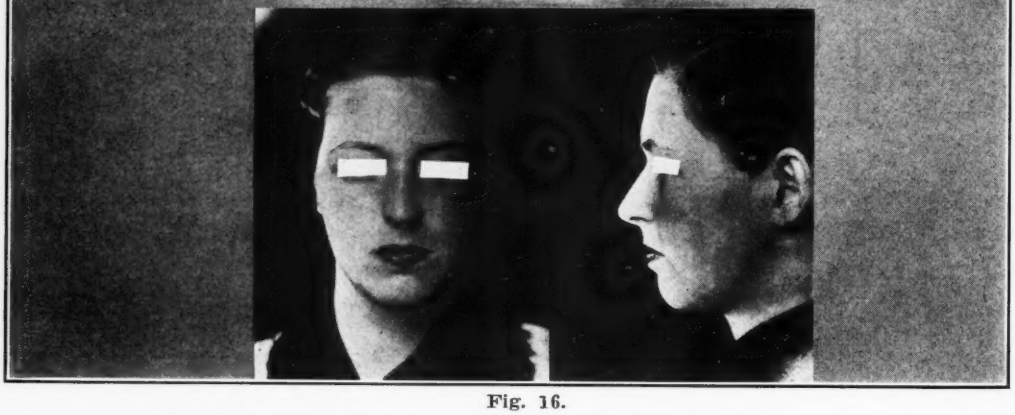

Fig. 16.

Fig. 12.—Class II Divison 1 case in young patient, complicated by underdevelopment of arches and maleruption of lateral incisors.

Fig. 13.—Photographs of patient with malocclusion seen in Fig. 12.

Fig. 14.—Models of case in Fig. 12 taken five years after removal of retaining appliances.

Fig. 15.—Photographs of patient in Fig. 12 taken after postoperative treatment on removal of retaining appliances.

Fig. 16.—Photographs of patient in Fig. 12 taken five years after removal of all retaining appliances. Compare with Fig. 15, and note change in facial lines as result of growth.

fullness of the lower third of the face, giving the semblance of a bimaxillary protrusion. There is very little, if any, development of the chin, and the lower

lip seems to be stretched in an effort to meet the upper one. Fig. 16 shows photographs taken five years later, at the same time as the models shown in Fig. 14. The fullness has disappeared probably through growth in the auriculonasion direction. The chin has grown somewhat and the drawn appearance of the lower lip is no longer present. The change in facial proportions is due to the growth that has taken place and has improved the general harmony of the features.

As pointed out by Lischer there is the type of case which is complicated by infraversion of the maxillary incisors. Such a condition is seen in Fig. 17, and here there is a further complication of supralinguoversion of the man-

Fig. 17.

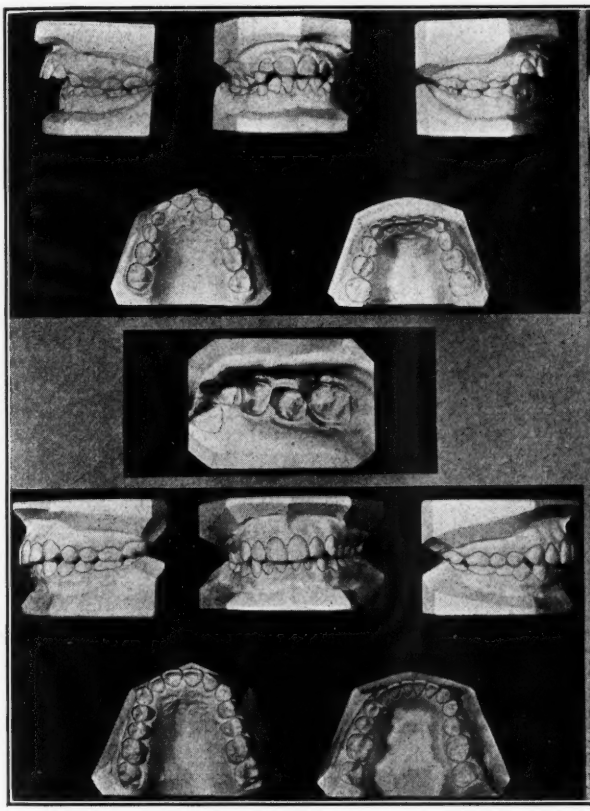

Fig. 18.

Fig. 19.



Fig. 20.



Fig. 21.

Fig. 17.—Class II Division 1 case complicated by infraversion of the maxillary incisors and supralinguoversion of the mandibular incisors.

Fig. 18.—Photographs of patient with malocclusion seen in Fig. 17. Note well-developed mentum and marked mentolabial sulcus.

Fig. 19.—Maxillary left second bicuspid erupted in torsiversion.

Fig. 20.—Result of treatment of case in Fig. 17.

Fig. 21.—Photographs of patient in Fig. 17 after treatment. Note continued growth of mentum with deep mentolabial sulcus characteristic of the individual in the same way as her nose.

dibular incisors. The arches are not markedly contracted. This patient, female, aged eight and one-half years, gave a negative history in regard to malocclusion in the family. She had been nursed in infancy. She was a thumb-sucker, still continuing the habit on occasion. She also had the habit of sucking her lower lip in moments of tension or abstraction. The photographs (Fig. 18) show a thick lower lip. The mentum is well developed with a well-defined mentolabial sulcus.

The maxillary arch was expanded with a junior pin and tube appliance. This permitted further eruption of the incisors which were then included in the appliance. Considerable lengthening of the mandibular arch was necessary because of the linguoversion of the incisors and was accomplished in the second step. While the patient was under treatment, the maxillary left second bicuspid erupted in almost complete torsiversion (Fig. 19). This was rotated by means of silk ligatures without any ill effects. Intermaxillary elastics were worn for only a few months.

The result of the treatment is seen in Figs. 20 and 21. The chin has continued in its growth, and the mentolabial sulcus is more accentuated. A deficient mentum is not necessarily a characteristic of Division 1. Rather, it is

Fig. 22. Fig. 23.

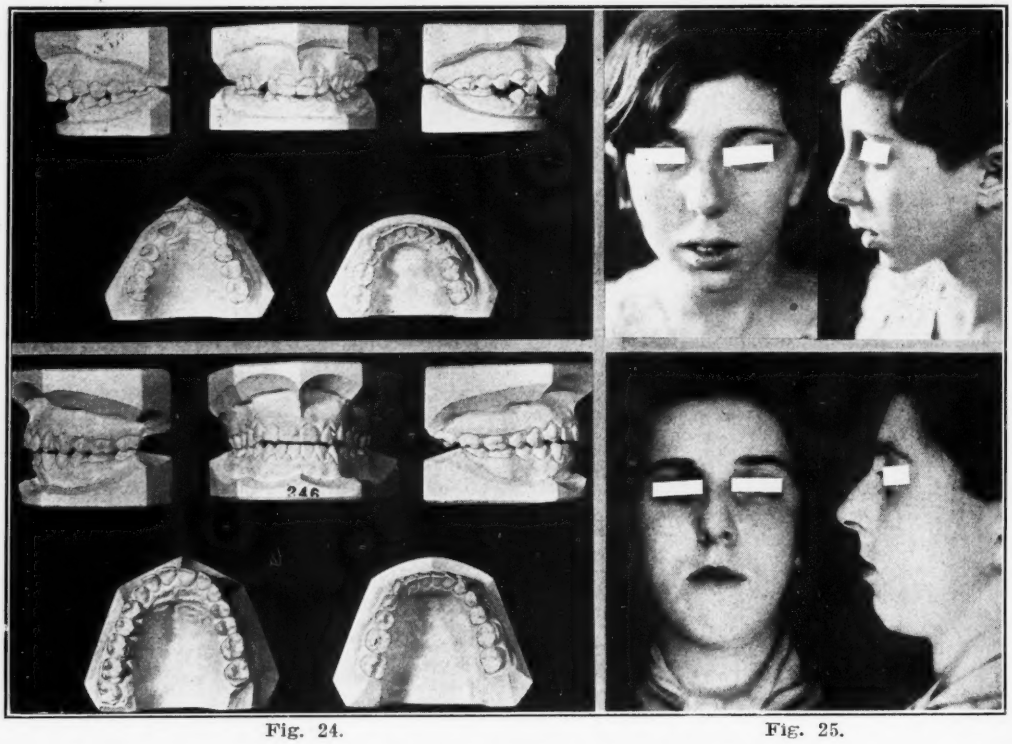

Fig. 24. Fig. 25.

Fig. 22.—Class II Division 1 case with narrow V-shaped maxillary arch.

Fig. 23.—Photographs of patient with malocclusion seen in Fig. 22.

Fig. 24.—Result of treatment of case shown in Fig. 22. Occlusion of anterior teeth affected by enamel hypoplasia.

Fig. 25.—Photographs of patient in Fig. 22 after treatment.

part of the growth pattern of the individual and continues to develop along its own lines irrespective of orthodontic interference. It is an individual imperfection. The well-developed mentum in this case is an individual characteristic in the same way as is her nose.

Different from the previous types is the condition in which there is a marked contraction of the maxillary arch, more so in the anterior region, with the result that the incisors are rotated and the dental arch is V-shaped. In such cases the curve of Spee is not, as a rule, very exaggerated (Figs. 22 and 23) unless there is an added complication of linguoversion of the mandibular

incisors. This patient, aged ten years, gave a negative history of malocclusion in the family with the exception of one cousin. The patient had been bottle fed from birth and had suffered from rickets, which resulted in hypoplasia of the enamel of the central incisors, cuspids, and molars. She was a constant mouth-breather, although both tonsils and adenoids had been removed at three years of age. There is a fairly well-developed mentum.

Fig. 6.

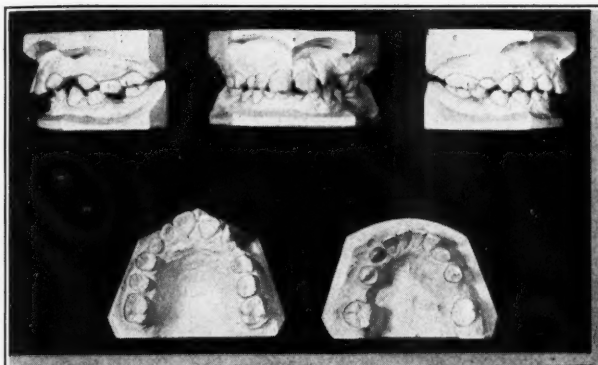

Fig. 27.

Fig. 28.

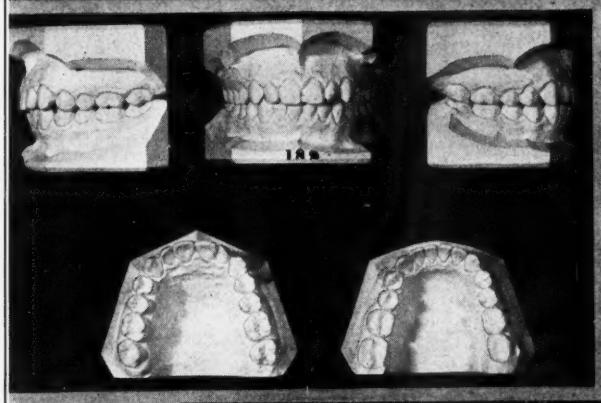

Fig. 29.

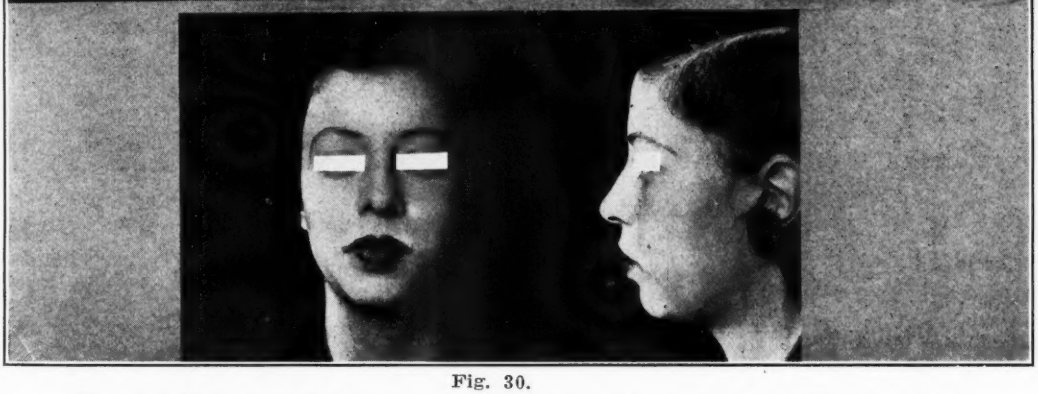

Fig. 30.

Fig. 26.—Class II Division 1 case complicated by labioversion of mandibular incisiors.

Fig. 27.—Photographs of patient with malocclusion seen in Fig. 26. Note fullness of upper lip although incisors are only slightly protruded.

Fig. 28.—Result of treatment of case in Fig. 26. Note corrected vertical axis of mandibular incisors.

Fig. 29.—Photographs of patient in Fig. 26 taken after removal of retaining appliances.

Fig. 30.—Photographs of patient in Fig. 26 taken four years after the removal of all retaining appliances. Compare with Fig. 29, and note changed proportions of face resulting from growth.

The result of the treatment is shown in Figs. 24 and 25. The occlusion of the anterior teeth is impaired by the absence of enamel tissue on the incisal

edges. Although the mandibular arch was brought forward and is remaining in its corrected position, there seems to have been very little, if any, growth of the mentum. Muscle exercises were prescribed and efforts were made to overcome the habit of mouth-breathing, but the necessary cooperation of the patient could not be enlisted. As a result the lower lip is definitely raised in an effort to keep the lips closed, accentuating the deficient chin. Note the subnormal ala and the almost occluded nostril on the right side.

The type of case which presents a great deal of difficulty in treatment is the one in which the mandibular as well as the maxillary incisors are protruded and tipped labially. The overbite is excessive, the incisal edges of

Fig. 31. Fig. 32.

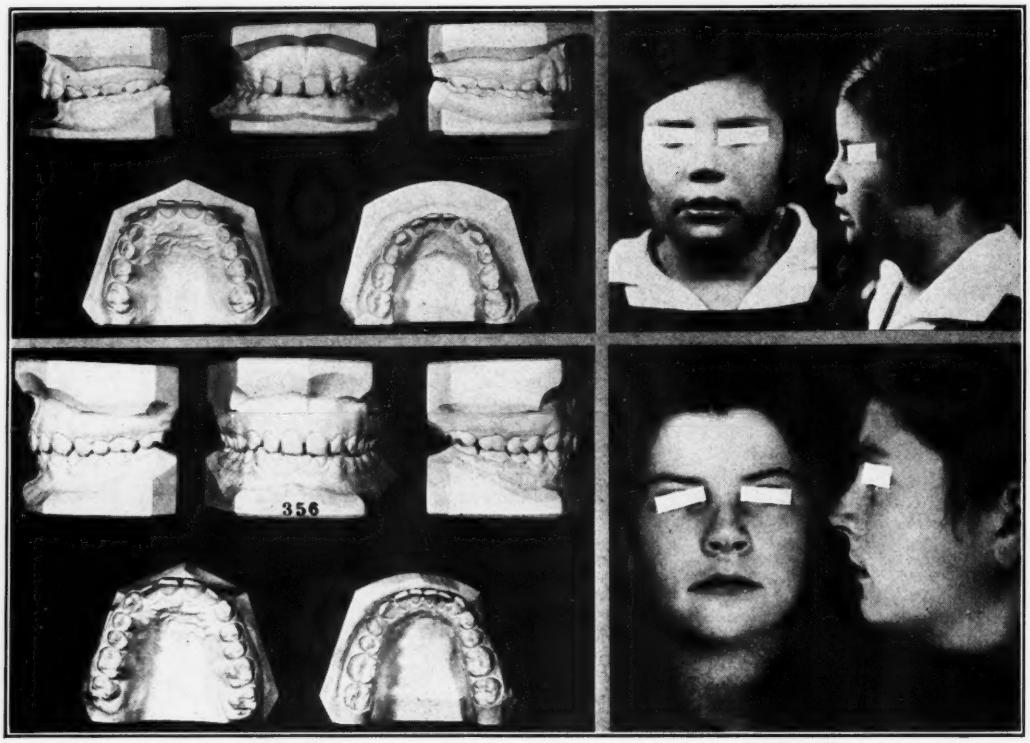


Fig. 33. Fig. 34.

Fig. 31.—Class II Division 1 case with maxillary incisors almost vertical and straight proximal surfaces. Mandibular incisors are spaced. Note the broad, well-developed arches.

Fig. 32.—Photographs of patient with malocclusion seen in Fig. 31.

Fig. 33.—Result of treatment of case in Fig. 31. Anatomy of incisors necessitates a slight spacing to avoid too broad a contact.

Fig. 34.—Photographs of patient in Fig. 31 taken after completion of treatment.

the mandibular incisors occluding with the lingual surfaces of the maxillary incisors at the gingival margin. A case of this type is seen in Figs. 26 and 27. The protrusion of the maxillary incisors is relatively small because of the protrusion of the mandibular incisors. The upper lip is short and the lower lip is thick. There was a history in this patient, aged nine years, of occasional sucking of the lower lip. This case has the appearance of a maxillary protraction.

Owing to the labioversion of the mandibular incisors the treatment indicated is a lingual tipping of these teeth before the arch is moved anteriorly.

This was accomplished by a light finger spring running along the labial surfaces of the incisors and soldered to the lingual appliance on the distal of both cuspids. The result of the treatment is seen in Figs. 28 and 29. Note the improved vertical axis of the incisors. The photographs give an appearance of a bimaxillary protrusion. This patient was seen recently, four years after the removal of all appliances, and the occlusion of the teeth has not altered. The proportions of the face have changed appreciably, and the protruded appearance of the lower third of the face is not so marked (Fig. 30).

Resembling this last type in its occlusion is that type of Division 1 case in which both arches are well developed and broad and both the maxillary

Fig. 35.

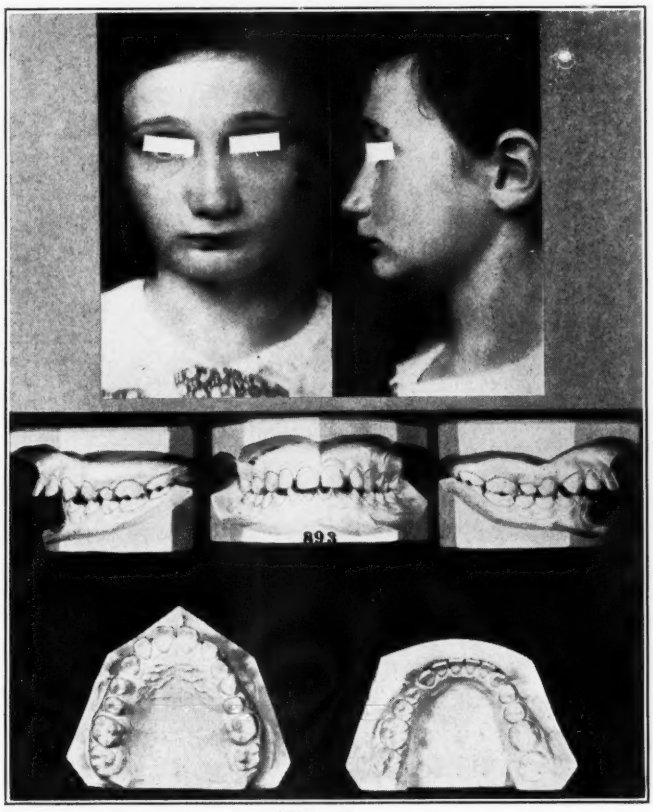


Fig. 36.

Fig. 35.—This type of face is usually associated with Class II Division 2. The occlusion of the teeth is that of Division 1 as seen in Fig. 36.

Fig. 36.—Models of teeth of patient in Fig. 35. A Class II Division 1 case.

and the mandibular incisors have considerable spacing between them, with their proximal surfaces straight instead of convex (Fig. 31). The incisal edges of the mandibular anterior teeth occlude with the lingual surfaces of the maxillary incisors at their gingival margins, presenting an excessive overbite. There is very little labioversion of the maxillary anterior teeth, and no expansion of the arches is required. The curve of Spee is slightly exaggerated. The family history of this patient, aged ten years, disclosed that a half-brother had a malocclusion. The patient had sucked her thumb when very young. The

photographs (Fig. 32) show the broad type of face. The mentum is well developed and the facial deformity not very marked.

The result achieved in this case is seen in Figs. 33 and 34. The anatomy of the incisors is such that a close contact between them was contraindicated. The use of a filigree wire bite-plane is advisable early in the treatment, as the lack of vertical growth in the posterior region must be overcome before the mandibular arch can be brought forward.

Division 2 of Class II has always been described as presenting a syndrome of normal lip and muscular pressure and normal breathing in contrast to Division 1 with its short upper lip and mouth-breathing. A definite picture has been created in our minds of the profile in such cases. However, this facial appearance is not strictly limited to Division 2 cases and cannot be accepted as symptomatic of them. The photograph shown in Fig. 35 is the type of face that is usually associated with Division 2. The models of the case show it to be a definite Division 1 case (Fig. 36). This type of condition serves as a warning against too definite and rigid a delineation of the various divisions and classes.

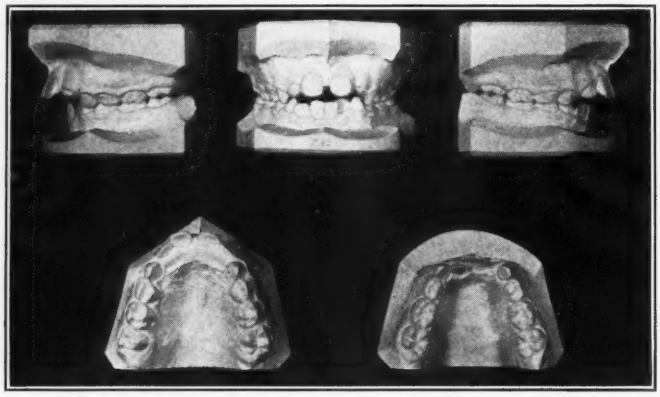

Fig. 37.—Class I case resembling Class II Division 1 except in mesiodistal relation of arches.

## ETIOLOGY

When we consider the question of etiology, we are confronted with rather a discouraging situation. As recently as 1932 at a meeting of this society in Toronto a symposium with the following title was given: "To What Definite Causes May Malocclusion and Its Attending Oral and Facial Abnormalities Be Attributed?" The conclusions were negative. Two of the three participants concluded directly from their discussion that the causes were not definite, and the discussion of the third participant arrived at the same conclusion indirectly.

A most valuable contribution to orthodontia has been made by Professor J. C. Brash of England in his book on *Aetiology*. In it he has carefully reviewed all the literature relative to etiology and has analyzed the evidence presented. His findings are, on the whole, negative, for he cannot accept environmental factors as causes. He suggests "that the time has arrived to substitute for the provisional hypothesis of environmental influence in the wide sense—which appears to have inspired most of the investigations and

most of the discussions that have taken place in the past—the other provisional hypothesis that irregularity and malocclusion are inherited conditions, and to let that inspire future discussions and future investigations." A careful perusal of the book leads to a skepticism which is healthy, provided it is not overdone.

Etiology is important, for we have been led to believe that successful treatment necessitates the removal of the cause. Prognosis must take into consideration the possibility of eliminating such cause. No successful attempt at prevention can be made as long as the factors producing the condition are unknown. With etiology in such an indefinite state, all our efforts at correction of dentofacial deformities should be attended with a great deal of misgiving and doubt. Actually, in the proceedings of this society numerous cases of Class II Division 1 malocclusions have been reported, and the results achieved by the treatment were very satisfactory from both the functional and the esthetic aspects. The treatment of these cases was based on the etiologic concept heretofore accepted. If the theories on the causes of this condition were wrong, then all our efforts should have ended in failure, with a relapse to the original condition. As this was not the case, we may be permitted to conclude that the factors previously accepted as causative of Class II Division 1 malocclusion may have some bearing on the development of this condition, or that a knowledge of the etiology is not always essential for successful treatment.

This discussion is necessarily limited to those factors, of whatever nature, which can be considered as causative of the Class II Division 1 syndrome. Purely local extrinsic factors, such as premature loss of deciduous teeth or supernumerary teeth, may be dismissed as complications of this syndrome but not causative of it.

The development of this associated group of symptoms of Class II Division 1 is not comparable to any pathologic process in any other part of the body. It is not the result of inflammation or bacterial infection, nor is it a new growth. The cells of the involved tissues may be perfectly normal. Rather, it is a deformity, and like deformities in other parts of the body it is a process of abnormal growth or development. Growth is twofold in nature. It involves not only an increase in size but also a change in proportion, and in the case of a complex structure like the skull this means an adjustment in position of the different parts.

The investigations of Campion, Keith, Hellman, Todd, Boas, Hrdlička, Brash and others on the mechanism of growth of the face have brought out facts which are of extreme importance. Growth of the face takes place in three dimensions—vertically, transversely or laterally, and anteroposteriorly. These dimensions grow at different rates, and different levels of the same dimension grow at different rates. In addition, growth occurs not as a continuous process but in periods of acceleration and periods of retardation. The development of the adult dentition occurs in stages, and the periods of accelerated and retarded growth of the face are related to these stages and to the stages in the development of the body as a whole.

The rôle of regulator of bodily growth has been assigned in recent years to that master of the endocrine organs—the pituitary gland. On the normal functioning of this gland depend the various spurts in bodily growth, and localized evidence of a disturbance in its function is seen in acromegaly. The pituitary affects the other endocrine glands and is in turn affected by them.

Not all children grow alike or according to a standard of growth arrived at by the statistical method. There is a range of variation within which growth is still normal. Their growth depends on various factors such as heredity, environment, nutrition, etc. Any disturbance sufficient to affect bodily health will affect the period of accelerated growth due at that time. In this way relative inharmony of the proportions of the face may develop. The mandible is not attached to the skull by sutures but by ligaments. Any disturbance in its growth at a time when the normal period of acceleration is due will result in an underdeveloped mandible or short ramus.

Hellman has investigated the relationship of Class II to other aspects of growth. He has concluded that other growth characteristics are concomitant with the occlusion in Class II Division 1 and may be used as an aid in the differential diagnosis between Division 1 and Division 2. The malocclusion may be a symptom only of a general discrepancy in growth.

In considering Class II Division 1 as a problem in growth, sight should not be lost of the rôle played by both heredity and environment. Growth is itself dependent to some extent on heredity, while the morphology of an individual is directed in a general way by his heredity. There is an inherited tendency to grow toward a certain type which gives us the family resembalances, although this is affected by environmental influences such as health, nutrition, and so on. In many cases of this type of deformity there is too great a resemblance between the offspring and the parents or other members of the family for the hereditary influence to be ignored entirely. Inheritance of the complete malocclusion as such may not be admissible, but to inherit the growth tendency toward a certain pattern of facial and bodily configuration is accepted. The narrow maxillary arch with protruding incisors may be part of the picture and the distal relationship of the mandible coincident with it. Whether this condition has originally arisen as a mutation is a debatable question.

Development along a pattern design is easily observable in our patients. At the age at which treatment is usually commenced, it is difficult to determine the final facial morphology of the individual. During the period of pubescence, a definite change in growth is frequently noticed and in such a way as to affect the appearance appreciably. Rapid growth is taking place, and the associated differentiation is changing the proportions of the face to build up a certain pattern and that in spite of all our orthodontic efforts. Often the adolescent face bears only a slight resemblance to the pretty childish face which applied for orthodontic treatment a few years previously. Hellman says, "Orthodontic treatment of Class II Division 1 and Class III cases influences the position of the teeth, their occlusal relationships and the probable adjustment of the alveolar arches. The tendencies of growth peculiar to these

types of occlusion do not seem to be changed, because they persist for long periods after the culmination of orthodontic treatment. Inherent tendencies of facial growth are not altered by changes in the occlusion of the teeth."

Continuous pressure does affect growth, as seen in the shape of the skulls of early Indian children and the feet of Chinese women. Lewis has shown that pernicious habits cause deformities in the jaws. To deny any relation between the habit of thumb-sucking or finger-sucking continued over a period of years and at least some of the symptoms of Division 1 is to deny the observations of clinical experience. Treatment of such condition is successful only when the habit is overcome, which makes the suggestion of causal relationship very strong. Admittedly there are cases in Class I with a history of thumb-sucking which bear a strong resemblance to Division 1 of Class II except in the relationship of the arches (Fig. 37). Admittedly, also, all cases of Division 1 do not give a history of some sucking habit. Neither do all cases with such a history present deformities of the Division 1 type or resembling the Class I type referred to. But sucking habits vary in the intensity, duration, and direction of application, and their effect on growth varies accordingly. This fact may account for the different types of conditions heretofore ascribed to this habit. The resistance of the individual must also be taken into account, and a feeble osseous tissue responds more readily to deforming influences. No scientific proof can be produced except by the statistical method, and, as that depends on the memory of parents or nurses and oftentimes their willingness to admit of such a habit, this method is not too dependable. Animal experimentation, if feasible, would afford some solution to the problem.

The main characteristic of Division 1 of Class II which distinguishes it from similar cases in Class I is the distal relationship of the mandibular arch. Consideration must be given to the effect of occlusion on growth. Lewis has drawn attention to the fact that, in that type of deciduous dentures in which the distal surfaces of the maxillary and mandibular second molars lie in the same plane, if the necessary occlusal adjustment does not take place to permit the mandible to shift forward, then maladjustment occurs either unilaterally or bilaterally. This may account for certain types of Class II. Experience has also taught us that in some mild types of Division 1 and in young patients the necessary expansion, especially in the cuspid region of the maxillary arch, permits the mandibular arch to shift forward and develop anteriorly and the mesiodistal relationship of the arches is partially corrected without the use of any plane or intermaxillary elastics. It seems that the narrow maxillary arch interferes with the forward positioning of the mandible, and the mere removal of such interference is sufficient to liberate the growth forces in the positioning of the mandible. Rogers has emphasized this in conjunction with his myofunctional therapy. This must be taken into consideration as an etiologic factor in the development of certain types of Division 1, that is, the development of a narrow maxillary arch causing the mandibular arch to assume a distal position.

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DRUMMOND MEDICAL BUILDING

# CLASS I MALOCCLUSION, WITH PRONOUNCED ANTERIOR OPEN-BITE, INDUCED BY CONSTANT FINGER-SUCKING, IN A MONKEY

HARRY E. KELSEY, D.D.S., F.A.C.D., BALTIMORE, MD.

THE rhesus monkey from which these illustrations were secured was one of a large number under observation at the Carnegie Laboratory of Embryology at the Johns Hopkins University.

Dr. John Marshall, during his research on tissue changes in monkeys incident to tooth movement for the American Society of Orthodontists, visited the Carnegie Laboratory where his attention was called to this monkey by Dr. Carl Hartman of the staff; and he suggested that Dr. Hartman communicate with me in regard to it, believing an orthodontist would be interested in such a case, providing as it does collateral evidence on the subject of thumb- and finger-sucking habits. I, personally, and also the members of the Society are thus indebted both to Dr. Hartman and to Dr. Marshall for the evidence presented.

When I arranged to go to the laboratory to see this monkey I expected that we would have to hide and keep very quiet in order to catch her sucking her finger. My apprehensions were quite groundless. The monkey presented no timidity or embarrassment regarding her habit, as children sometimes do, and the only time I saw her without the finger being in her mouth was when she was running around the cage or the runways. The moment she stopped, she would immediately stick the left forefinger into her mouth, as can be seen in Fig. 3, where she is sucking her finger while hanging on to the wire grill forming one side of the runway. After regaining consciousness from the ether (which had to be administered in order to get impressions) this was also her first voluntary act.

We know, of course, that this or any other habit indulged in constantly by a child will have a marked effect upon the form and development of the structures involved. This case is to me gratifying collateral evidence of this fact. The monkey, a female about four and a half years old, had indulged in this habit since or even before weaning. I regret I have no motion picture of this case. I fully intended to get it but was assured by Dr. Henry Klein that he could and would get it, which he did, but apparently forgot to give a copy of it to Dr. Hartman and it has been impossible to get it in time for this presentation.

Dr. Klein and Dr. Kyrle W. Preis (my associate at the time) aided me, along with Dr. Hartman and his assistants, in securing the impressions. The first attempt was made without an anesthetic and proved futile. While not apparently a vicious animal, this monkey disliked above all else having observations made upon her teeth and in her mouth, a characteristic of all animals, including the human. The second attempt was made after an administration of avertin,

Read before the American Society of Orthodontists, St. Louis, April 20-22, 1936.

and while the monkey was exceedingly sleepy and quite indifferent to general handling, she roused up and vigorously resisted impression making. Ether was thereupon administered, and the impressions were then made without much difficulty. She appeared to suffer no ill effects from the anesthetic, notwithstanding the fact that she had had some food within several hours previous to the ether administration.

Fig. 1.

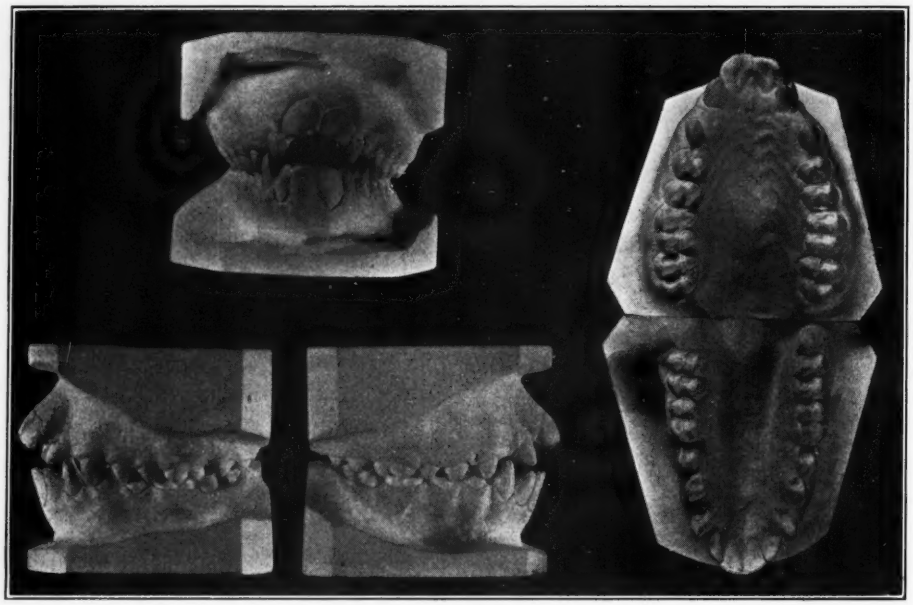


Fig. 2.

To construct impression trays I used the model of a child's maxillary arch, sawing it apart and then trimming off a good sized segment from the medial margin, putting the two halves together again and trimming up the teeth somewhat. This made a model quite similar to the monkey's maxillary arch upon which trays were adapted of vacuum material, and mandibular trays were then constructed to match them approximately. Impressions were made with an

elastic compound which gives very good copies of under cuts. Of several taken, the best were preserved and several duplicates made.

When Dr. Klein left Baltimore to accept a research position at Yale, he requested permission of Dr. Hartman to take the monkey with him, which was granted, and later Dr. Klein took her to Detroit where Dr. Samuel Lewis seems to have made some observations with him upon her. She died soon after this and it is possible that further interesting data, together with the moving picture, may be presented at some future time, if it seems worth while.

The photographs were made by either Dr. Hartman or his assistants at the Carnegie Laboratory of Embryology at the Johns Hopkins University.

Fig. 1 is a close up, full face, and profile of the mouth, illustrating clearly the bending upward of the premaxillary alveolar process and teeth, and the

Fig. 3.

bending down of the mandibular alveolar process and anterior teeth. In the full face view, the almost circular aperture leading into the mouth while the teeth are closed can be noted.

Fig. 2 shows views of the models.

The picture shown in Fig. 3 was taken while the monkey was clinging to the side of the cage with her two feet and right hand, and shows the exact technic employed by her in sucking her left forefinger.

In conclusion, this case seems to me to offer additional evidence that the advice sometimes given (even by doctors of all kinds) that thumb- and finger-sucking habits do no harm, is a pernicious evasion of the truth, because while it is true that such habits indulged in over a short period will do little, if any, harm, they are rarely voluntarily discontinued, and except in the rarest instances when the

habit is indulged in only at intervals, invariably produce malformations in the dental arches. There is, of course, a marked difference in the response of different individuals both to habit distortions and to orthodontic treatment, but in the end normal bone yields to pressure.

833 Park Avenue

## DISCUSSION

*Dr. Samuel J. Lewis, Detroit.*—I am sorry that I did not know about the movie film of the finger-sucking monkey, as I made a copy from the original film and have it on file at the University of Detroit. I shall be pleased to loan it to Dr. Kelsey any time he wishes to show it, and I can assure you it is a most interesting record.

This monkey was brought to my attention by Dr. Klein shortly after Dr. Kelsey made his observations and records, and I suggested that some means be employed either to break the habit or to prevent further indulgence. I thought we might see a self-correction of the malocclusion as we sometimes do in human beings. However, all methods but one failed, and before that could be tried for a long enough period, the monkey contracted miliary tuberculosis and died.

Since seeing this monkey, two others which also sucked their fingers were sent to me from the Yale University Laboratories. While the malocclusions were not so pronounced as in Dr. Kelsey's case, there was a decided anterior protrusion and open-bite, such as we all see in our human patients. In one case the right fingers were sucked and the displacement was toward the right.

In view of this evidence presented by Dr. Kelsey, and that which I presented in 1929, there is no doubt but that finger-sucking habits do alter the arch form and tooth position if indulged in over a protracted period. I concur most heartily in Dr. Kelsey's conclusions.

# COOPERATION

HARVEY G. BEAN, D.D.S., TORONTO, CANADA

THIS case is reported to stress the need of a factor which I feel is sometimes neglected in planning treatment of cases, and yet is one that should be planned for in greater or lesser degree in all our cases. I mean the cooperation of the patient. Only by enlisting the aid of the patient can one obtain the quickest and best results. Care of appliances, functional stimulation, and the creating of a muscular balance in soft tissues are only a few of the ways in which a patient's cooperation is necessary.

This particular case is reported because for eight long years it was treated without the patient's interest being aroused. The patient was more or less dragged in to consult me by his mother, who had herself gone through life with a very marked maxillary protrusion, and who, in spite of eight years of treatment of her son, had not become entirely discouraged of some result being obtained. The boy's attitude was one of passive resistance. He was thoroughly fed up with treatment. The orthodontist who had been treating the case was also fed up, and assured me that he'd "be darned if he'd do any more for the young devil," and while he was kind enough to wish me luck if I undertook to continue, he was positive that no satisfactory result could be obtained.

The man who had carried on previously had had long experience. His appliances looked efficient; were, as a matter of fact, appliances which some orthodontists will say are the most efficient type—the pin and tube. The patient's health had been excellent, and he must have been through growth spurts during this previous treatment as he was five feet nine in height and weighed one hundred and fifty-five pounds at the age of sixteen on coming to see me. His health history was good.

Undoubtedly the case should have been completed before this time, but was far from it. After going into the matter of the patient's side of treatment quite thoroughly, the case was undertaken. Appliances were inserted in May, 1928, consisting of first permanent molar overlays, maxillary and mandibular, a high labial and a lingual arch on the maxillary teeth, and a lingual arch on the mandibular. An intermax elastic was used on the left side. Later a bite crib was added, and finally a bite plate was inserted. Mechanical treatment was uneventful, and in just under two years, April, 1930, all appliances were removed.

The incisal edges of the incisors were trimmed for esthetics, and the bite was ground in to assure a masticatory balance. The patient was instructed

Presented at the meeting the the American Society of Orthodontists in St. Louis, April 20, 1936.

to continue the orbicularis oris exercise to tone the lips, and the rubber bite strap for tonicity and function. Casts were made six months later, November, 1930, when the patient was finally dismissed. A third cast, a labial bite, was made October, 1935.

To summarize the factors that were present during the eight years of previous treatment as against the two years of second treatment, we find:

1. Any factor of heredity existing during the first eight years still existed.

2. The health factor so far as could be ascertained was no better during the second treatment than it was during the first.

3. Growth spurts of equal or greater degree had taken place during the first treatment.

Fig. 1.

Fig. 2.

Fig. 3.

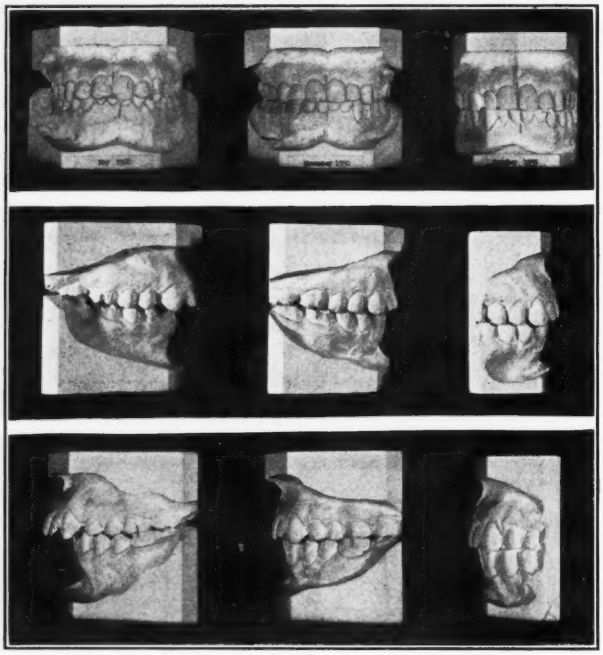


Fig. 1.—Anterior aspect. Reading left to right: (*1*) case on starting; (*2*) six months after removal of appliances; (*3*) labial bite five years after second casts.
Fig. 2.—Right lateral views.
Fig. 3.—Left lateral views.

4. The appliances used during the first treatment, pin and tube appliances, would, I think, be conceded an equal rating in moving teeth as the Lowrie high labial and the Mershon linguals. So far as anchorage is concerned 17 bands were used with the pin arches as against 4 overlays with the high labial and linguals.

5. The orthodontist who had previously carried on the case had much longer experience than I; consequently I feel that the one big factor in obtaining a result in this case was that of cooperation.

The patient's desire to do his part was aroused to the extent that when I asked him to help the mandible to shift to the right he did it in a way that made it easy for the appliances to stimulate the teeth to move to a position

of advantage with the mandible in proper centric relationship. The orbicularis oris exercise he did faithfully, and last but not least, he exercised with a bite strap long enough to get the bite settled down to where over a five-year period there was only a slight relapse. In view of the fact that he had already had ten years of appliances I did not ask the privilege of carrying on a further treatment in an attempt to gain a hundred per cent result.

MEDICAL ARTS BUILDING

# EFFICIENT PRACTICE MANAGEMENT AS A MEANS OF INCREASING THE QUALITY OF AND EXTENDING THE AVAILABILITY OF ORTHODONTIC SERVICE

FLOYD E. GIBBIN, D.D.S., BUFFALO, N. Y.

IN THESE troubled days of economic stress, social and political unrest, with many baffling problems pressing for solution, it seems a most opportune time to stop and take careful inventory of ourselves—to consider seriously our responsibility to our patients and our opportunity for rendering an increased measure of service.

Responsibility means "being answerable or accountable legally or morally for the discharge of an obligation, a duty or trust."

Now, as we critically analyze the situation, just how well have we fulfilled this responsibility, this obligation, this duty which unquestionably we owe the vast number of children who are victims of oral and facial deformities which will endanger their health and handicap their opportunity to succeed socially, in business or profession throughout life?

The measure of successful achievement attained in any profession is in direct ratio to the quality of service rendered and to the degree in which said service is made available to the public.

Authoritative sources inform us that there are approximately 45,000,000 children between the ages of five and twenty years in this country. The White House Conference on Child Health estimated that 80 per cent of these children suffer from major or minor defects of occlusion—and yet, sad to relate, only 2 per cent receive orthodontic treatment.

The question next arises, just who is responsible for this deplorable situation? The issue can be side-stepped with the usual various alibis, but in the last analysis much of this responsibility rests squarely on our own shoulders.

Dr. H. C. Pollock in an editorial of the March, 1936, issue of the INTERNATIONAL JOURNAL OF ORTHODONTIA AND ORAL SURGERY says, "Orthodontists must not be blinded to the fact that there will ultimately be an urgent demand for modern and competent orthodontic service for much wider brackets of society than have existed in the past and they must realize that this very thing is now happening in a more or less slow motion tempo that will gain momentum from year to year."

The U. S. Chamber of Commerce tells us that the annual income of our population is divided as follows:

2 per cent have an income of over $10,000
3 per cent have an income of $5,000 to $10,000
50 per cent have an income of $2,000 to $5,000
45 per cent have an income of less than $2,000.

Presented at the Thirty-Fourth Annual Meeting of the American Society of Orthodontists, St. Louis, Mo., April 20-23, 1936.

If our profession is to attain the highest goal of useful service, then it must devise ways and means of providing orthodontic service for this 95 per cent of the population who earn only a modest income. The solution of this problem involves a number of highly important factors:

1. The highest quality of service must be maintained.
2. Orthodontic service must be produced at a lower cost in order that fees may be brought within the reach of a far greater number of patients.
3. The orthodontist must receive an adequate compensation for his services.

Will any of the impractical, unproved socialistic theories advanced solve this problem? Unquestionably no. Will "mail order" diagnosis and treatment in the hands of inexperienced men assist? This will only help to make a bad situation worse. What, then, is the answer?

Does it not seem that the most logical and practical approach to our problem lies in an expansion of existing facilities for producing orthodontic service through:

1. The development of greater executive ability on our own part.
2. The development of a highly efficient organization of capable well-trained assistants.
3. A more efficient and systematic management of our practices.
4. Increased facilities for efficient production.
5. Greater simplification of treatment along lines of the modern biologic concept. This will permit longer intervals between appointments, thus conserving the time of the orthodontist which will enable him to care for a larger number of patients.
6. Extensive educational publicity among both the dental profession and the laity regarding the beneficial results which may be accomplished through the interception and prevention of malocclusion.

The gigantic growth and development of American business and industry can be attributed largely to the capacity for organization and highly efficient management. Many of these same fundamentals can be utilized in our practices to great advantage and yet conform strictly to the highest ethical concepts.

If orthodontic practice is to fulfill its responsibilities in full measure, then it must grow and develop from the limited one man set-up to a highly efficient, carefully coordinated unit capable of producing not only the highest quality of service but an increased availability of service in its respective community. Ours is a big job with much to be accomplished, yet one with tremendous opportunities for worthwhile service. Each one of us has a definite individual responsibility in the solution of the collective problem of meeting the increasing demand for orthodontic service. Who can better solve this problem than the orthodontic profession itself?

The thing of greatest tangible and potential value which the orthodontist can give his patients is the total of his accumulated knowledge, skill, ability, and experience. However, if he is personally to perform the many small

details of office routine, then he must of necessity limit his sphere of usefulness. On the other hand, he can most materially enlarge his sphere of usefulness through employment of capable, carefully trained assistants to relieve him of the burden of routine details, thus conserving his time for diagnosis and analysis of cases, planning of treatment, and actual treatment of cases, things which only the orthodontist himself can do.

The first requirement is a competent, highly efficient secretary. She must of necessity be trained and experienced in stenography and bookkeeping. She should care for all details of business office routine, including correspondence, record keeping, appointments, telephone, reception and dismissal of patients, credits and collections, banking, purchasing of supplies. She must be thoroughly capable of efficiently handling every detail of her department.

Next of importance in our organization is the laboratory technician. My observation is that, in most respects, a capable, methodical painstaking young woman is far more satisfactory than a man. With proper training, she is just as efficient in laboratory procedures, and, in addition, if occasion requires, can easily assist in the duties of either the chair assistant or the secretary. In times of illness or vacations this feature is very valuable. The technician should be thoroughly capable of handling every phase of laboratory procedures.

The chair assistant must be a thoroughly alert, capable girl with the capacity of anticipating in advance every need of the orthodontist. A girl who has had training for a nurse makes an ideal chair assistant. In the smaller practice the duties of secretary and chair assistant can be combined.

There is no place in modern practice for the gum chewing, magazine reading, telephone gossiping type of assistant. The efficiency of our personnel will be in direct ratio to our own efficiency. Our assistants must possess a pleasing personality combined with a high degree of personal efficiency. They must possess intelligence, tact and diplomacy, courtesy, honesty and integrity, ambition, loyalty, with a genuine love for their work. It has been said that a capable executive is one who has the ability to hire people who can do his work for him better than he can do it himself.

Efficient supervision and management of our practices are possible only when we are in possession of detailed information regarding all phases of our work. This necessitates the use of an accurate record keeping and cost accounting system. Do you know the actual cost of producing a completed orthodontic correction? If not, then how can you estimate fees that are fair and equitable both to the patient and to yourself? Do you know exactly what the overhead cost per hour is? Do you know how much of your time is productive and how much is nonproductive? Do you know what your capital investment is, in the form of cost of college education, postgraduate training, inventory of office equipment and furnishings? What are your credit losses, and how can you reduce them? What is the ratio of your overhead expense to cash receipts?

The following system has been developed, not only from my own ideas and experiences but from those of a number of other men. It is impossible

to acknowledge the source of each idea and suggestion obtained; so I want publicly to acknowledge and thank all those who have contributed suggestions in the development of this system. It has been found very practical in operation and most complete in the information it supplies. One hour of the secretary's time each day is ample for its operation.

Standardized abbreviations have been found valuable in conserving space and at the same time allowing for detailed entries in the different records. This list may, of course, be revised or added to, to suit individual preference.

ABBREVIATIONS

| | |
|---|---|
| Appliance Adjusted | AA |
| Appliance Broken | AB |
| Appliance Cemented | AC |
| Appliance Removed | ARM |
| Appliance Repaired | ARP |
| Appliance Constructed | ACT |
| Auxiliary Springs | Axs |
| Bands Fitted | BF |
| Bands Re-Cemented | BREC |
| Bite Plane | BP |
| Broken Appointment | BA |
| Buccal Stops | BS |
| Buccal Tubes | BTU |
| Cancelled Appointment | CA |
| Canine | C |
| Case Analysis | CAS |
| Central Incisor | CI |
| Compound Work Model Impressions | CWMI |
| Consultation | CON |
| Contract Made | CM |
| Dentocoll Record Impressions | DRI |
| Diagnosis | DS |
| Examination | Ex |
| Extraction | Ext |
| Fixed Removable Appliance | FRA |
| Impacted Tooth Attachment | ITA |
| Instructions to Wear Intermaxillary Elastics | IWIE |
| Intermaxillary Hooks | IH |
| Labial Arch | LA |
| Lateral Incisor | LI |
| Left | L |
| Lingual Arch | LIA |
| Ligature | Lg |
| Maxillary | Mx |
| Mandibular | Md |
| Molar | M |
| Observation | O |
| Premolar | Pm |
| Photographs | Pg |
| Prophylaxis | P |
| Radiographs | X |
| Reference Thanked | RT |
| Referred to Family Dentist | RFD |
| Rest Period | RP |
| Right | R |
| Roger's Exercises Used | RE |
| Separating Contacts | SC |
| Soldered Lingual Arch | SLA |
| Toothbrush Instruction | TI |

The Appointment and Day Book Record (Fig. 1), as the term implies, is a combination of the ordinary appointment book and day book. It is the score card of one's practice and records each detail of the day's activities.

Appointments are made in advance and names entered together with services planned for that appointment. This enables the secretary to plan the amount

**APPOINTMENT AND DAY BOOK**

Tuesday, April 21, 19 35

PREVIOUS TOTALS 4620 380 290 $945

| HOUR | | NAME | SERVICE | C | L | D | CASH | | ✓ |
|---|---|---|---|---|---|---|---|---|---|
| 8 | 00 | | | | | | | | |
| | 15 | | | | | | | | |
| | 30 | | | | | | | | |
| | 45 | | | | | | | | |
| 9 | 00 | Ward Osborne | DRI - SC | 30 | | | 50 | 00 | ✓ |
| | 15 | | | | | | | | |
| | 30 | | | | | | | | |
| | 45 | | | | | | | | |
| 10 | 00 | Jack Bowman | M X M B F - CWMI | 30 | | | | | ✓ |
| | 15 | | | | | | | | |
| | 30 | Shirley Brown | Md AA - AC | 30 | | | 20 | 00 | ✓ |
| | 45 | | | | | | | | |
| 11 | 00 | Earl Sanborn | Broken Arch repaired | | | | | | |
| | 15 | | Axs replaced | 25 | 30 | 55 | | | ✓ |
| | 30 | | | | | | | | |
| | 45 | | | | | | | | |
| 12 | 00 | | | | | | | | |
| | 15 | | | | | | | | |
| | 30 | | | | | | | | |
| | 45 | | | | | | | | |
| 1 | 00 | Marion Randall | Con. Mother - EX - DS - | | | | | | |
| | 15 | | R F D - Dr. Morgan XEX | 40 | | | | | ✓ |
| | 30 | | | | | | | | |
| | 45 | | | | | | | | |
| 2 | 00 | Betty Morgan | X D S - C M - C A S | 60 | | | | | ✓ |
| | 15 | | | | | | | | |
| | 30 | | | | | | | | |
| | 45 | | | | | | | | |
| 3 | 00 | Herbert Strong | B. A. | | | | | | |
| | 15 | | | | | | | | |
| | 30 | John Randolph | MX La. inserted - IWIE | 20 | | | | | ✓ |
| | 45 | | | | | | | | |
| 4 | 00 | Raymond Lacy | MX & MD ARM - RFD for P&EX | 10 | | | | | ✓ |
| | 15 | William Brown | MX & MD AA | 15 | | | 15 | 00 | ✓ |
| | 30 | Henry Baker | O | 5 | | | | | ✓ |
| | 45 | Jeanne Ransom | A X S repaired | 10 | 5 | 15 | | | ✓ |
| 5 | 00 | Ruth Bayley | MX & MD AA | 15 | | | | | ✓ |
| | 15 | Robert Brewer | Retainer Adjusted | 10 | | | | | ✓ |
| | 30 | Florence Bartlett | MD M B F - CWMI - Pg | 45 | | | | | ✓ |
| | 45 | | | | | | | | |
| 6 | 00 | | | | | | | | |
| | 15 | | | | | | | | |
| | 30 | | | | | | | | |
| | 45 | | | | | | | | |

MEMO

H. P. Graham (check) 75 00 ✓
J. P. Brooks (check) 20 00 ✓

Eighth Dist. Dental Society
Hotel Statler 6:30 P. M.

Write R. B. Wallace about account ✓

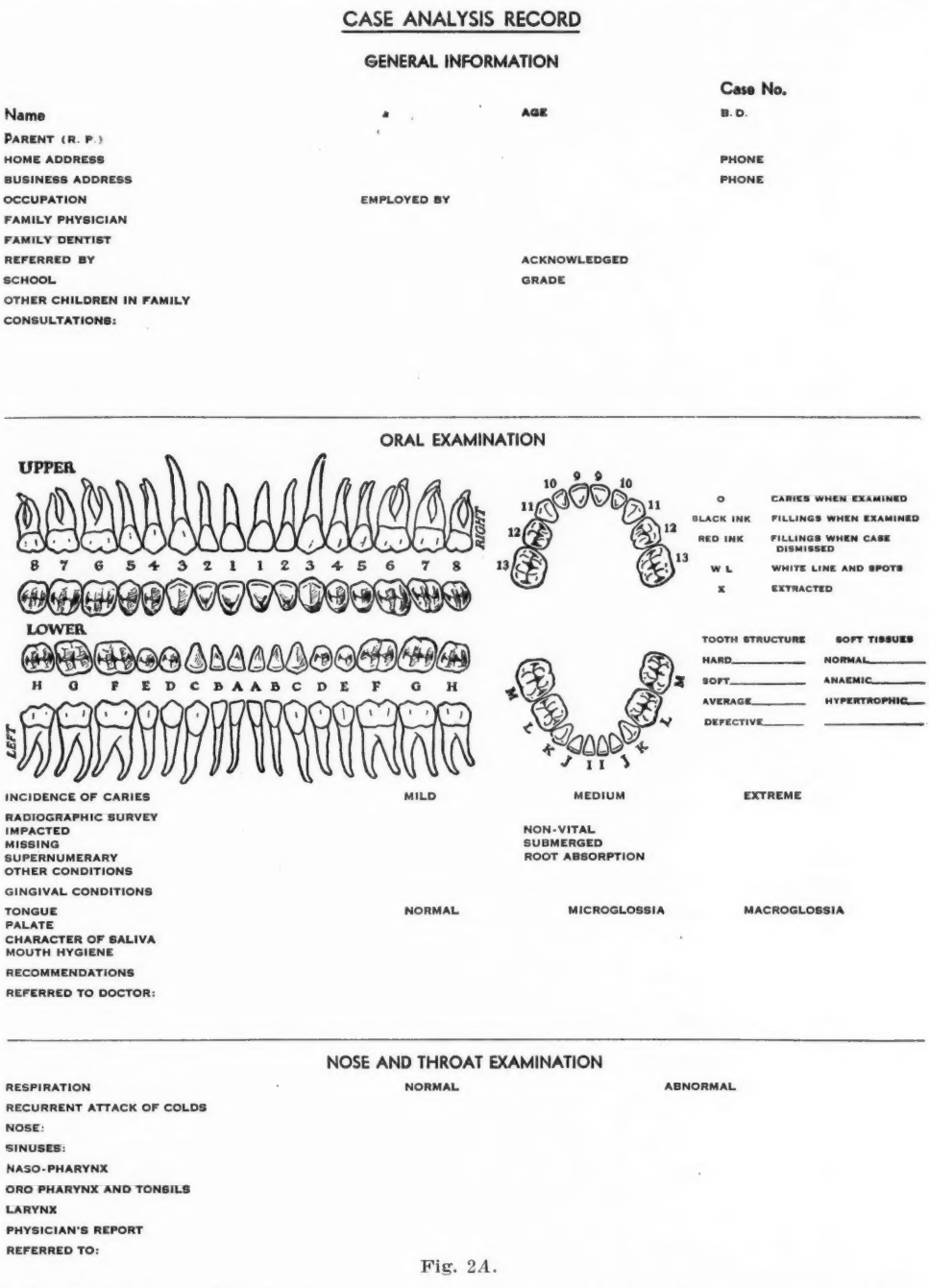
| | | | | | |
|---|---|---|---|---|---|
| TOTAL TODAY | 345 | 35 | 70 | 180 | 00 |
| TOTAL FORWARD | 4965 | 415 | 360 | 1125 | 00 |

DR. F. E. GIBBIN, BUFFALO, N. Y.

Fig. 1.

of time required and eliminates much waste motion. Appointments are entered in pencil, and then on the day it becomes the Day Sheet, the pencil entries are erased and entered in ink, thus making it a permanent record.

Space is provided for entering the time spent at the chair, in the laboratory; and the Discount Column is used to record all waste time, such as repairs, make-overs, broken appointments, etc. Payments made either in cash or by



CASE ANALYSIS RECORD

GENERAL INFORMATION

Case No.

Name — AGE — B. D.

PARENT (R. P.)

HOME ADDRESS — PHONE

BUSINESS ADDRESS — PHONE

OCCUPATION — EMPLOYED BY

FAMILY PHYSICIAN

FAMILY DENTIST

REFERRED BY — ACKNOWLEDGED

SCHOOL — GRADE

OTHER CHILDREN IN FAMILY

CONSULTATIONS:

ORAL EXAMINATION

UPPER

RIGHT

8 7 6 5 4 3 2 1 1 2 3 4 5 6 7 8

10 9 9 10 11 12 13

LOWER

H G F E D C B A A B C D E F G H

LEFT

M L K J I I J K L M

| | |
|---|---|
| O | CARIES WHEN EXAMINED |
| BLACK INK | FILLINGS WHEN EXAMINED |
| RED INK | FILLINGS WHEN CASE DISMISSED |
| W L | WHITE LINE AND SPOTS |
| X | EXTRACTED |

| TOOTH STRUCTURE | SOFT TISSUES |
|---|---|
| HARD | NORMAL |
| SOFT | ANAEMIC |
| AVERAGE | HYPERTROPHIC |
| DEFECTIVE | |

| | | | |
|---|---|---|---|
| INCIDENCE OF CARIES | MILD | MEDIUM | EXTREME |
| RADIOGRAPHIC SURVEY | | | |
| IMPACTED | | NON-VITAL | |
| MISSING | | SUBMERGED | |
| SUPERNUMERARY | | ROOT ABSORPTION | |
| OTHER CONDITIONS | | | |
| GINGIVAL CONDITIONS | | | |
| TONGUE | NORMAL | MICROGLOSSIA | MACROGLOSSIA |
| PALATE | | | |
| CHARACTER OF SALIVA | | | |
| MOUTH HYGIENE | | | |
| RECOMMENDATIONS | | | |
| REFERRED TO DOCTOR: | | | |

NOSE AND THROAT EXAMINATION

| | | |
|---|---|---|
| RESPIRATION | NORMAL | ABNORMAL |
| RECURRENT ATTACK OF COLDS | | |
| NOSE: | | |
| SINUSES: | | |
| NASO-PHARYNX | | |
| ORO PHARYNX AND TONSILS | | |
| LARYNX | | |
| PHYSICIAN'S REPORT | | |
| REFERRED TO: | | |

Fig. 2*A*.

Fig. 2.—A four-page folder for the case record: *A*, front of folder; *B* and *C*, inside of folder; *D*, back of folder.

check are entered in the Cash Column; and, when these entries are posted to the Treatment and Account Records, a check is made in the check column to indicate completion of the record. This one feature eliminates many mistakes.

Previous totals at top of page show totals up to date from the first of the month. Total Today and Total Forward are self-explanatory. The Memo space at bottom of the sheet has been found most convenient for reminders of various details to be cared for—birthday cards to be sent, collection letters

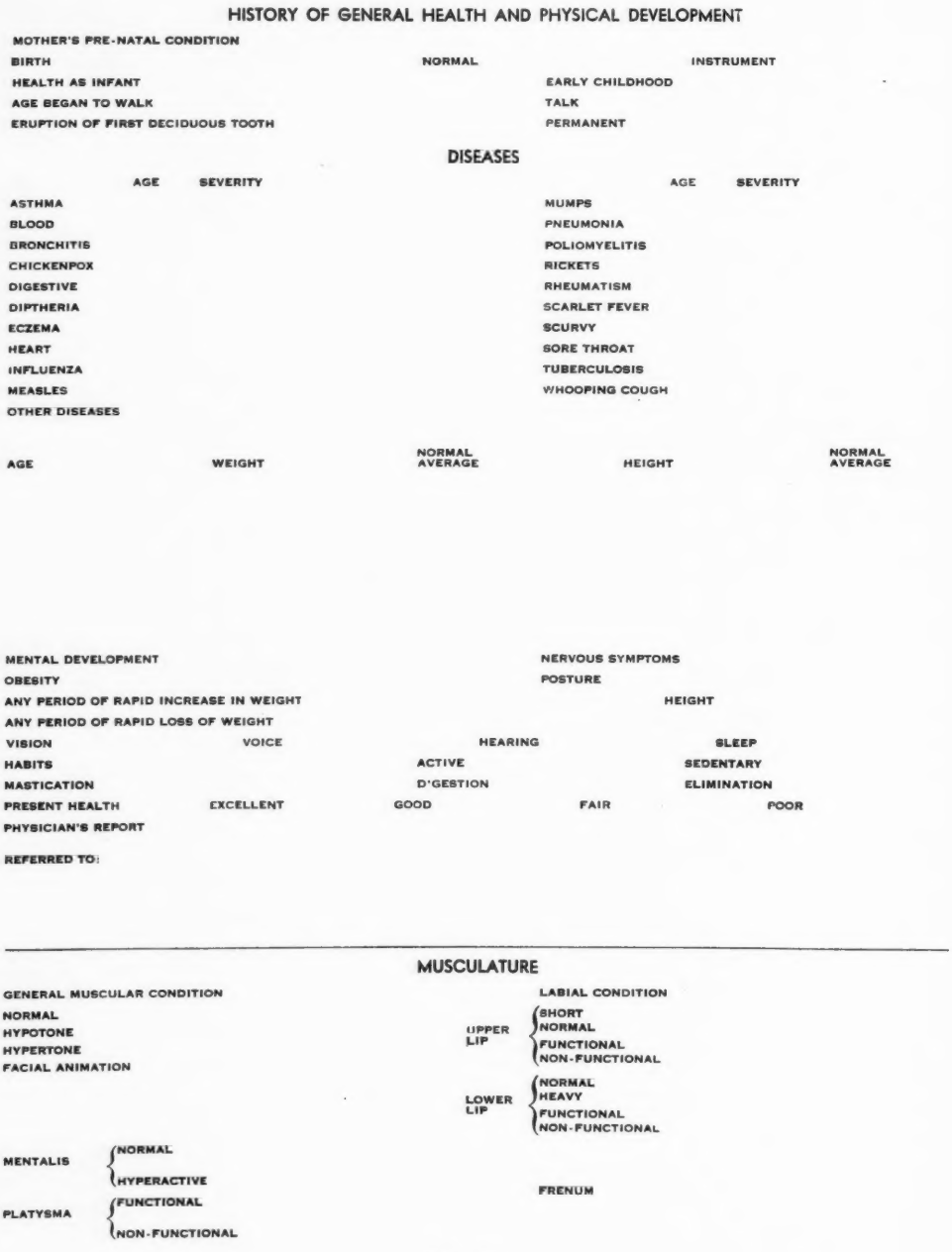



Fig. 2*B*.

written, dates of dental meetings, and the many other small yet important details which are easily overlooked or forgotten in the busy practice.

It seems highly obvious that if more time and more care were excercised in a careful study and analysis of the case before treatment, many errors

might be prevented and much valuable time saved. Case analysis should be done in a logical manner and the conclusions recorded on suitable forms for reference, throughout the case. When a definite decision is to be recorded in writing, we make a more careful and detailed study before reaching the final conclusion.

FACIAL FORM

DIET

PRE-NATAL DIET:

BREAST FED LENGTH BOTTLE FED LENGTH

WHY?

HOW WAS PATIENT FED DURING INFANCY?

HOW WAS PATIENT FED DURING EARLY CHILDHOOD?

PRESENT DIET

RECOMMENDATIONS:

REFERRED TO:

ETIOLOGY

PREDISPOSING CAUSES:

1 ACUTE INFECTIOUS DISEASES
2 CHRONIC INFECTIOUS DISEASES
3. ACUTE DEFICIENCY DISEASES
4 CHRONIC DEFICIENCY DISEASES
5 METABOLIC DISTURBANCES
6 ENDOCRINE UNBALANCE
7 PRE-NATAL ABNORMALITIES
8 CONGENITAL DEFECTS
9. HEREDITY
10 UNKNOWN CAUSES
11 OTHER CONDITIONS

REFER TO NO.

DETERMINING CAUSES:

12. MISSING TEETH
13. SUPERNUMERARY TEETH
14 TRANSPOSED TEETH
15. MALFORMED TEETH
16. ABNORMAL LABIAL FRENUM
17. INTRA-UTERIN PRESSURE
18. PREMATURE LOSS OF DECIDUOUS TEETH
19. TARDY ERUPTION OF PERMANENT TEETH
20. PROLONGED RETENTION OF DECIDUOUS TEETH
21 LOSS OF PERMANENT TEETH
22. DENTAL RESTORATIONS
23. PRESSURE HABITS:--MOUTH BREATHING, TONGUE, LIP, THUMB OR FINGER, SLEEPING, POSTURE, OTHER HABITS

CLASSIFICATION

| LEFT | RIGHT |
|---|---|
| ☐ NEUTROCLUSION | ☐ |
| ☐ DISTOCLUSION | ☐ |
| ☐ MESIOCLUSION | ☐ |
| ☐ MUTILATED | ☐ |

MEDIAN PLANE

DESCRIPTION:

PROGNOSIS

FAVORABLE, UNFAVORABLE

POSTPONEMENT OF TREATMENT ADVISED

IMMEDIATE TREATMENT ADVISED

SUBSEQUENT OBSERVATION ADVISED

PLAN OF TREATMENT

MAXILLARY

MANDIBULAR

ASSOCIATED HOME TREATMENT

RETENTION MAX. MAND.

Fig. 2*C*.

The Case Analysis Record (Fig. 2) provides ample space for recording all data necessary for a complete and detailed analysis of the case. It is divided into subheadings for General Information, Oral Examination, Nose and Throat Examination, History of General Health and Physical Develop-

ment, Musculature, Facial Form, Diet, Etiology, Classification, Prognosis, Plan of Treatment, Type of Patient, References, Estimated Treatment, Fee and Terms, with plenty of space under Special Notations for recording unusual

Fig. 2*D*.

aspects of the case. This is much less confusing than data all crowded together on a 5″ × 7″ card and allows for a more detailed and comprehensive analysis. The securing of data for this record conveys to the parent the

conviction that orthodontia consists of far more than the mere mechanical "fitting of braces" and creates a better understanding of the problems involved.

**TREATMENT RECORD**

P. N. Marion T. Randall AGE 10 B. D Jan. 14, 1925
ADDRESS 174 Sterling Avenue, Buffalo, N. Y. PHONE Un. 7489
F. D. Dr. S. W. Crosby R. B Dr. S. W. Crosby

| RIGHT | | LEFT | HABITS | | X-RAY | |
|---|---|---|---|---|---|---|
| ☐ | NEUTROCLUSION | ☐ | | TONGUE | | MISSING |
| ☒ | DISTOCLUSION | ☒ | | LIP X | | IMPACTED |
| ☐ | MESIOCLUSION | ☐ | | THUMB X | | NON-VITAL M X R C I |
| ☐ | MUTILATED | ☐ | | FINGER | | SUPERNUMERARY |
| | | | | PILLOW | | |

| DATE | TREATMENT | C | L | D |
|---|---|---|---|---|
| 1935 | | | | |
| 9/11 | Con. Mother - Ex - DS - RFD for XEX | 30 | | |
| 9/18 | Con. Mother - XDS - CAS data secured - CM | 60 | | |
| 9/21 | DRI - MXSC - PG | 50 | | |
| 9/24 | Study of CAS and planning of treatment | 180 | | |
| 9/26 | MX M B F - CWMI | 30 | | |
| 9/30 | M X M B Cemented - AA | 25 | | |

Dr F E. Gibbin Buffalo, N. Y

Fig. 3.

The Treatment Record (Fig. 3) is used to record each step of treatment as it progresses throughout the case. Provision has been made for recording the classification, habits, and abnormalities as revealed by the x-ray examina-

tion which needs to be kept foremost in mind. The abbreviation list is used in conjunction to simplify the entries in order that a more detailed record may be kept. The three columns at the right of the page allow for entries of time spent at the chair, in the laboratory, and for discount time where is recorded waste time as the result of repairs, make-overs, and other lost effort. When one sees the discount time on a case, greater effort will be made to reduce this waste of both time and energy.

Filing of each patient's records is best accomplished by the use of a standard commercial filing folder. In this folder will be placed the Case Analysis Record, the Treatment Record, the x-ray pictures of the case, photographs, gnathostatic records if used, carbon copy of the confirmation letter, credit data, carbon copies of collection letters, carbon copies of all other correspondence. Different color papers have been used for the Case Analysis Record and Treatment Record, to make it easier to locate the record desired in the folder. Thus we have all data pertaining to the case in one folder which is easily located by means of index guides in the filing cabinet. Much valuable time can be conserved through proper filing methods.

The Account Record (Fig. 4) is used for setting up charges against the patient's account when the case is started. Provision is made for recording name of responsible party, home and office address and telephone numbers, as well as where statements are to be sent. It is flexible and easily adaptable in that charges may be made monthly, quarterly, semiannually, or by any other method desired.

The Cash Receipts Record (Fig. 5) offers an accurate yet simple means of recording the receipt of all money collected, together with the source from which it was received in the form of Treatment Fees—Preliminary Fees—Consultation Fees and Miscellaneous Cash, such as scrap sales, etc. The subtotals of each column together with the grand total show total cash receipts for the month.

In the Disbursement Record (Fig. 6) is recorded the payment of all bills. It provides for distribution of the various items of overhead expense, investment expense, and personal withdrawals. All bills with exception of Petty Cash expenditures should be paid by check. At the end of each week or month, as desired, the secretary records all checks drawn, showing the date, name of payee, and the particular item of expense distributed where indicated. The subtotals of each column, together with the grand total, show total disbursements for the month.

For obvious reasons it is considered good practice to keep all pretreatment cases under periodic observation. The Recall Record (Fig. 7) provides a simple yet systematic means of listing the names, addresses, and telephone numbers of these patients, together with the date desired that they be recalled for further observation. For example, a patient is examined in April and the parent advised that it would be well to see the patient again in six months. The secretary then makes the proper entry on the Recall Record for October.

When this time arrives, the parent is called and a definite appointment made. It has been found very helpful in eliminating errors in the recall of patients.

**ACCOUNT RECORD**

Marion T. Randall
P. N.

R. P. James P. Randall
HOME ADDRESS 174 Sterling Avenue PHONE Un. 7489
OFFICE ADDRESS 1486 Rand Bldg. PHONE Cl. 6321
CITY Buffalo STATE New York
SEND STATEMENT TO Home Address

| DATE | SERVICE RENDERED | FEE | DATE | CREDIT | BALANCE |
|---|---|---|---|---|---|
| 19 36 | | | | | |
| Apr. 14 | Preliminary Fee | | 4/31 | Check | |
| May | Treatment Fee | | 5/26 | Check | |
| June | " " | | 6/20 | Check | |
| July | " " | | 7/26 | Check | |
| Aug. | " " | | 8/30 | Check | |
| Sept. | " " | | 9/21 | Check | |
| Oct. | " " | | 10/28 | Check | |

DR. F. E. GIBBIN, BUFFALO, N. Y.

Fig. 4.

No time need be spent in pointing out the value of maintaining friendly relations with our patients. To the child a birthday is an event, and it pleases him to be remembered and to receive a birthday greeting from his orthodontist.

It is very seldom that a patient fails to thank me, showing that he appreciates this thoughtful interest in him. The Birthday Record (Fig. 8) is an easy yet

**CASH RECEIPTS RECORD**

April 19 36

| DATE | NAME | TREATMENT FEES | PRELIMINARY FEES | CONSULTATION FEES | MISCELLANEOUS CASH |
|---|---|---|---|---|---|
| 2 | John R. Bowman | 15 00 | | | |
| 2 | James Sanborn | 20 00 | | | |
| 2 | Henry Newcastle | 20 00 | | | |
| 3 | John R. Ames | 15 00 | | | |
| 3 | H. K. Bassett | 75 00 | | | |
| 3 | Buffalo Dental Mfg. Com (Scrap Gold) | | | | 31 85 |
| 3 | J. D. Osborne | | 50 00 | | |
| 4 | Albert R. Gordon | | | 5 00 | |
| 5 | Geo. M. Benner | 15 00 | | | |
| 5 | C. D. Sullivan | 15 00 | | | |
| 5 | N. D. Levy | 20 00 | | | |
| | TOTAL CASH RECEIPTS TOTALS | | | | |

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Fig. 5.

systematic means of keeping an accurate record of the birthdays of our patients. A stock of several dozen greeting cards is kept on hand and mailed by the secretary at the proper time.

Likewise, illness, convalescence, and Christmas cards help to show our friendly interest in the patient and are important factors in creating good

**DISBURSEMENT RECORD**

April 19 36

| DATE | NAME | ITEMS | OVERHEAD EXPENSE | INVESTMENT EXPENSE | PERSONAL WITHDRAWALS |
|---|---|---|---|---|---|
| 10 | Linwood Medical Centre | RENT | 100 00 | | |
| | | ELECTRICITY & GAS | | | |
| 8 | N. Y. Telephone Company | TELEPHONE | 8 90 | | |
| 11 | Parkhill & Hart | LAUNDRY | 7 65 | | |
| | | SALARY | | | |
| 30 | | Secretary | 80 00 | | |
| 30 | | Technician | 80 00 | | |
| 12 | Buffalo Dental Mfg. Co. | PRECIOUS METALS | 39 85 | | |
| 14 | Davis-Schultz Co. | | 19 67 | | |
| | | MATERIALS & SUPPLIES | | | |
| 16 | Buffalo Dental Mfg. Co. | | 11 02 | | |
| 21 | Davis-Schultz Co. | | 16 41 | | |
| 17 | Gurtner & Johnson | LABORATORY | 9 50 | | |
| 15 | Community Chest Fund | CONTRIBUTIONS | 20 00 | | |
| 1 | | PETTY CASH | 12 00 | | |
| | | MISCELLANEOUS EXPENSE | | | |
| 20 | A. S. O. Meeting - St. Louis | | 161 00 | | |
| 23 | Eighth Dist. Dental Society Dues | | 10 00 | | |
| 15 | Burton Mfg. Co. Photographic Apparatus | | | 130 00 | |
| 24 | Fisher Machine Co. Plaster Trimmer | | | 96 15 | |
| 5 | F. E. Gibbin | Personal Acct. | | | 50 00 |
| 14 | F. E. Gibbin | | | | 100 00 |
| | | DEPRECIATION | | | |
| TOTAL DISBURSEMENTS | | TOTALS | | | |

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Fig. 6.

will. In view of these greetings being cared for at definite times, no record seems necessary.

A standardized system of form letters expressly designed for definite purposes will save a great deal of needless conversation, valuable time and en-

ergy, and also will produce much more effective results. These letters should cover many of the routine office procedures, such as broken appointments,

**RECALL RECORD**

April 19 36

| NAME | ADDRESS | PHONE NO. | CALLED | RESULT |
|---|---|---|---|---|
| Betty Scanlon | 186 Cleveland Ave. | Ga. 8421 | 4/2 | Appt. made |
| Marion Bruso | 61 Inwood Place | Gr. 2574 | 4/2 | Appt. made |
| Sherman Edgerton | 14 Delwood Road | Cl. 2619 | 4/3 | Appt. made |
| John T. Vail | 618 Linden Ave. | Pa. 2279 | 4/3 called, will phone |
| James R. Gray | 406 Fourth Ave. | Cl. 1601 | 4/4 | Appt. made |
| Henry T. Bement | 165 Sterling Ave. | Gr. 3207 | 4/4 | Appt. made |

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Fig. 7.

tardy appointments, "thank you" letters to those referring cases, failure to wear intermaxillary elastics as directed, collection letters, lack of proper home care, necessity for periodic prophylaxis and examination, distortion of appli-

ances, failure to carry through with associated home treatment in the form of various developmental exercises. Letters can easily be designed which will

**BIRTHDAY RECORD**

April 1936

| | NAME | ADDRESS | GREETING SENT |
|---|---|---|---|
| 4 | Jeanne Clark | 16 Locust St.--Niagara Falls, N. Y. | 4/3 |
| 10 | Samuel Lacy | 79 East Ave.--Lockport, N. Y. | 4/9 |
| 16 | Alice Murphy | 414 Auburn Avenue, Buffalo, N. Y. | 4/15 |
| 18 | Joan Bement | 81 Berkley Place--Buffalo, N. Y. | 4/17 |
| 18 | Jane Burton | 139 Tacoma Ave.--Buffalo, N. Y. | 4/17 |
| 22 | Henry Simon | 678 Winston Road.--Buffalo, N. Y. | 4/21 |
| 28 | Bertrand Webster | 129 Linden Avenue--Buffalo, N. Y. | 4/27 |

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Fig. 8.

fit most cases, but when occasion demands they can readily be altered to fit the individual case. A competent secretary makes the use of these valuable time savers almost automatic. Obviously, to be most effective, they should be

made as personal as possible, which means that they should be individually typed on the regular letterhead and personally signed by the doctor. Such letters command attention, which means that they are read and are far more effective in producing results than the cold impersonal printed cards commonly used.

Collection difficulties are largely our own fault because of lack of definite understanding in advance in regard to payments and to lack of a definite systematic method of follow-up of delinquent accounts.

The Collection Record (Fig. 9) shows the status of all accounts receivable at a glance, together with the paying record of each individual patient from month to month without having to go through the entire account book. It provides a definite record of all collection follow-up, such as telephone calls, letters, reminding of patient, personal interviews, payments promised, together with dates of each. It is the "squeaky wheel that gets the grease." Successful collections are the result of systematic methodical follow-up rather than spasmodic spurts and starts.

The Recapitulation Record (Fig. 10) gives an accurate and searching analysis of just what is going on in our practice. It shows the progress we are making. It points out our mistakes and shortcomings, our sins both of omission and of commission. It shows how much of our time is productive and how much is nonproductive. It shows the source and financial classification of patients referred to us. It shows our accounts receivable, the amount our treatment fees should be each month, the amount of new fee contracts made. It shows the number of active and inactive cases, those under pretreatment observation, those cases transferred in, dropped and transferred out. The next thing that merits our careful study and consideration is the nonproductive or waste time as shown in discount hours. Here we record our grief—repairs, make-overs, time wasted through broken appointments, time required for services necessary beyond our original estimate, those cases commonly known as "chair warmers." The information which the Recapitulation Record reveals is most illuminating. It is only when we can correctly diagnose our situation that we can devise proper treatment for correction.

The Cash Receipts and Expense Distribution Record (Fig. 11) gives an accurate and comprehensive recapitulation month by month of all money collected and paid out. It gives a clear-cut picture of the exact financial status of the practice at all times.

The Cash Receipts Distribution shows the total cash collected each month —the source from which it was received each month—the receipts to date each month from the first of the year, together with the total receipts for the year.

The Expense Distribution allocates each important item of overhead expense to its proper place each month. It shows total case expense, provides for monthly depreciation if desired, shows total expense deductible for income tax purposes, undeductible expense, total overhead expense, investment expense, personal withdrawals, and the overhead percentage in its relation to cash receipts. In the efficiently managed practice the percentage of overhead should not exceed 33⅓ per cent of the cash receipts.

At the end of each year, the secretary can close and balance the books, providing all data necessary for income tax purposes in one hour's time. It

**COLLECTION RECORD**

L—Letter T. C.—Telephone Call
P. P.—Promised Payment R. P.—Reminded Patient P. I.—Personal Interview

| NAME | MO. Feb. 1936 | REMARKS | MO. Mar. 1936 | REMARKS | MO. Apr. 1936 | REMARKS |
|---|---|---|---|---|---|---|
| J. P. Ames | 75 00 | L 2/15 \| TC 2/25 | 75 00 | PP 3/5 | 25 00 | |
| H. N. Arnold | | | | | | |
| B. E. Aaron | 30 00 | R.P. 2/16 | 50 00 | L 3/15 | 20 00 | |
| F. C. Appleton | 60 00 | L. 2/15 | 60 00 | L 3/1 \| L. 3/20 | | |
| E. N. Bogart | 100 00 | L 2/1 \| L 2/20 | 100 00 | L 3/1 \| TC 3/15 | 100 00 | P.I. Paid |
| J. N. Brown | 20 00 | | 20 00 | L 3/1 | | |
| E. S. Bailey | | | | | | |
| H. C. Carley | 30 00 | | 50 00 | L 3/15 | 20 00 | |
| D. H. Copley | | | | | | |
| A. R. Cady | | | | | | |
| TOTALS | | | | | | |

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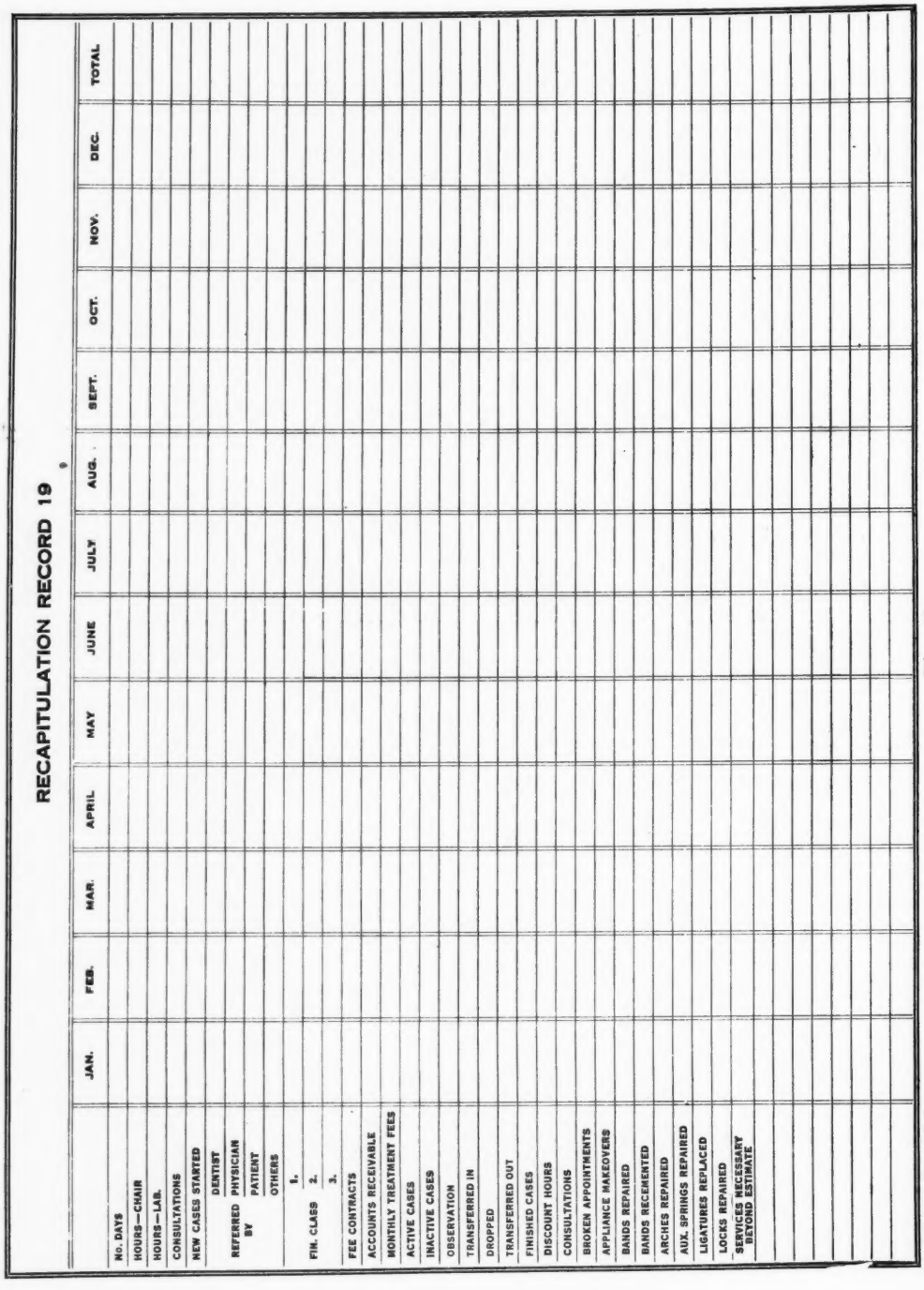
Fig. 9.

provides up-to-the-minute accounting each month and saves a great deal of valuable time, as compared with the necessity of going over the books for the entire year and segregating the necessary items for tax reports.

Guesswork opinions are one thing, but authentic information is the only thing which enables us to analyze comprehensively the long range perspective



RECAPITULATION RECORD 19

| | JAN. | FEB. | MAR. | APRIL | MAY | JUNE | JULY | AUG. | SEPT. | OCT. | NOV. | DEC. | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. DAYS | | | | | | | | | | | | | |
| HOURS—CHAIR | | | | | | | | | | | | | |
| HOURS—LAB. | | | | | | | | | | | | | |
| CONSULTATIONS | | | | | | | | | | | | | |
| NEW CASES STARTED | | | | | | | | | | | | | |
| REFERRED BY DENTIST | | | | | | | | | | | | | |
| REFERRED BY PHYSICIAN | | | | | | | | | | | | | |
| REFERRED BY PATIENT | | | | | | | | | | | | | |
| REFERRED BY OTHERS | | | | | | | | | | | | | |
| FIN. CLASS 1. | | | | | | | | | | | | | |
| FIN. CLASS 2. | | | | | | | | | | | | | |
| FIN. CLASS 3. | | | | | | | | | | | | | |
| FEE CONTRACTS | | | | | | | | | | | | | |
| ACCOUNTS RECEIVABLE | | | | | | | | | | | | | |
| MONTHLY TREATMENT FEES | | | | | | | | | | | | | |
| ACTIVE CASES | | | | | | | | | | | | | |
| INACTIVE CASES | | | | | | | | | | | | | |
| OBSERVATION | | | | | | | | | | | | | |
| TRANSFERRED IN | | | | | | | | | | | | | |
| DROPPED | | | | | | | | | | | | | |
| TRANSFERRED OUT | | | | | | | | | | | | | |
| FINISHED CASES | | | | | | | | | | | | | |
| DISCOUNT HOURS | | | | | | | | | | | | | |
| CONSULTATIONS | | | | | | | | | | | | | |
| BROKEN APPOINTMENTS | | | | | | | | | | | | | |
| APPLIANCE MAKEOVERS | | | | | | | | | | | | | |
| BANDS REPAIRED | | | | | | | | | | | | | |
| BANDS RECEMENTED | | | | | | | | | | | | | |
| ARCHES REPAIRED | | | | | | | | | | | | | |
| AUX. SPRINGS REPAIRED | | | | | | | | | | | | | |
| LIGATURES REPLACED | | | | | | | | | | | | | |
| LOCKS REPAIRED | | | | | | | | | | | | | |
| SERVICES NECESSARY BEYOND ESTIMATE | | | | | | | | | | | | | |

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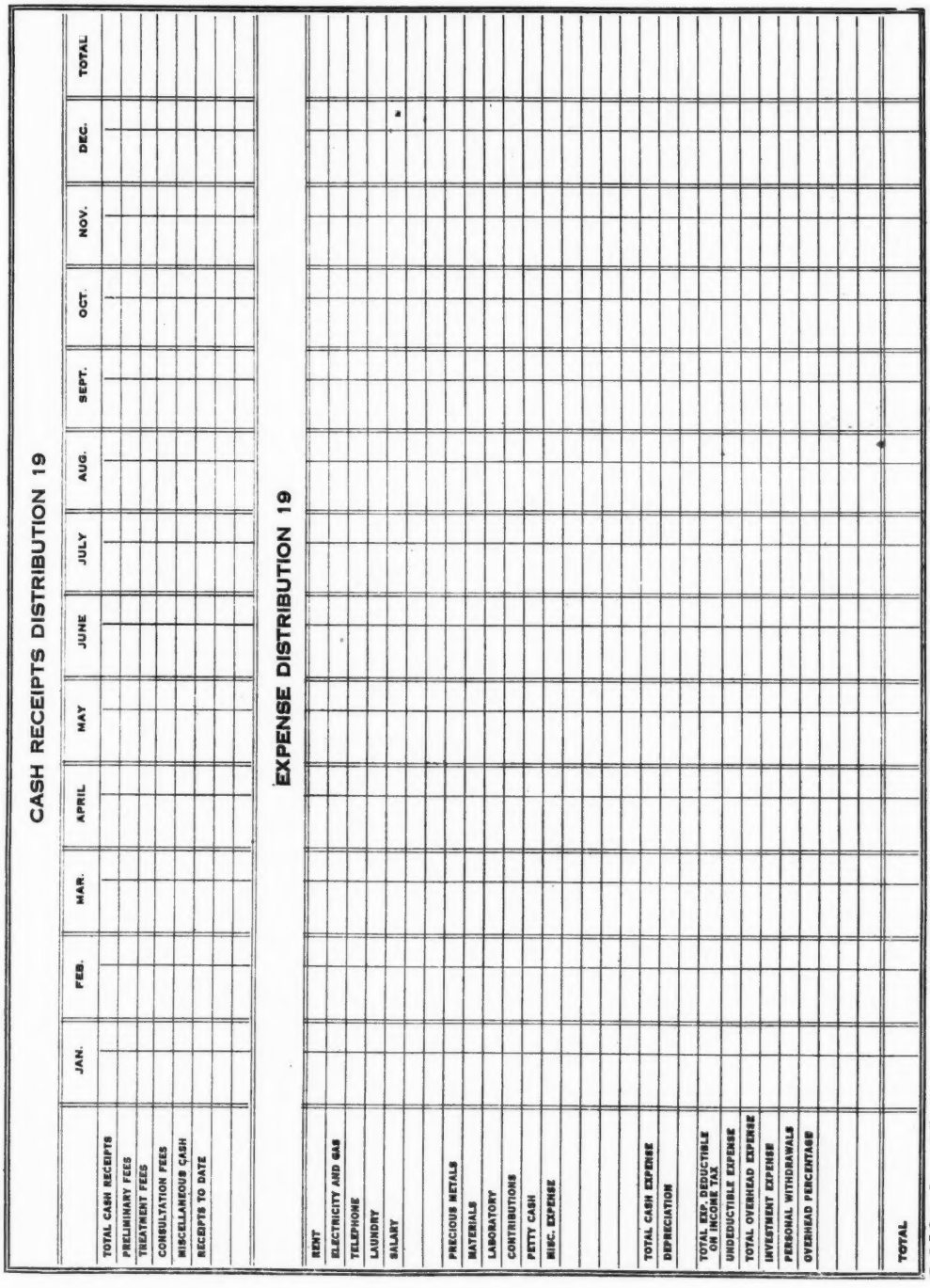
Fig. 10.

of our activities. An analysis of our completed cases, properly recorded, provides a most illuminating knowledge of the variation in cases. This information is of real value in the handling of future cases and consistently utilized over a period of years should result in a much more intelligent ap-

proach to the many and varied problems of treatment. The Analysis of Cases Record (Fig. 12) provides for classification, dates started, dates completed,



| CASH RECEIPTS DISTRIBUTION 19 | JAN. | FEB. | MAR. | APRIL | MAY | JUNE | JULY | AUG. | SEPT. | OCT. | NOV. | DEC. | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TOTAL CASH RECEIPTS | | | | | | | | | | | | | |
| PRELIMINARY FEES | | | | | | | | | | | | | |
| TREATMENT FEES | | | | | | | | | | | | | |
| CONSULTATION FEES | | | | | | | | | | | | | |
| MISCELLANEOUS CASH | | | | | | | | | | | | | |
| RECEIPTS TO DATE | | | | | | | | | | | | | |

| EXPENSE DISTRIBUTION 19 | JAN. | FEB. | MAR. | APRIL | MAY | JUNE | JULY | AUG. | SEPT. | OCT. | NOV. | DEC. | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RENT | | | | | | | | | | | | | |
| ELECTRICITY AND GAS | | | | | | | | | | | | | |
| TELEPHONE | | | | | | | | | | | | | |
| LAUNDRY | | | | | | | | | | | | | |
| SALARY | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| PRECIOUS METALS | | | | | | | | | | | | | |
| MATERIALS | | | | | | | | | | | | | |
| LABORATORY | | | | | | | | | | | | | |
| CONTRIBUTIONS | | | | | | | | | | | | | |
| PETTY CASH | | | | | | | | | | | | | |
| MISC. EXPENSE | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| TOTAL CASH EXPENSE | | | | | | | | | | | | | |
| DEPRECIATION | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| TOTAL EXP. DEDUCTIBLE ON INCOME TAX | | | | | | | | | | | | | |
| UNDEDUCTIBLE EXPENSE | | | | | | | | | | | | | |
| TOTAL OVERHEAD EXPENSE | | | | | | | | | | | | | |
| INVESTMENT EXPENSE | | | | | | | | | | | | | |
| PERSONAL WITHDRAWALS | | | | | | | | | | | | | |
| OVERHEAD PERCENTAGE | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| TOTAL | | | | | | | | | | | | | |

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Fig. 11.

hours spent at the chair and in the laboratory, total hours, fees, discount hours which present an appalling picture of nonproductive time, number of appointments, number of broken appointments, overhead cost per hour, material costs if desired, total cost to us of producing a completed orthodontic

case, total cost per hour, gross rate per hour, profit rate per hour. This analysis will show just what a consistent reasonable fee should be, yet one which

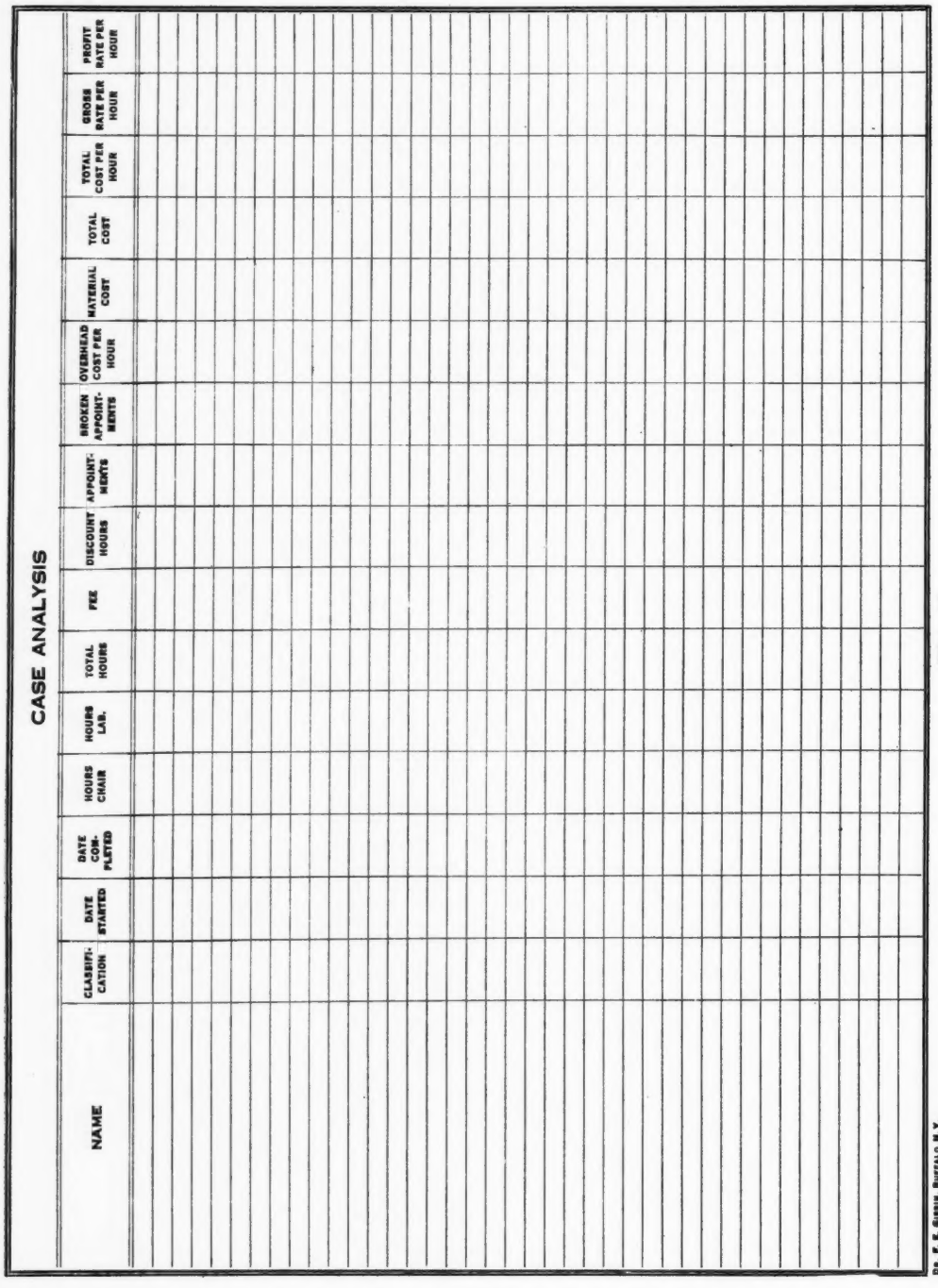



Fig. 12.

will show the orthodontist an adequate compensation for his services. It takes the guess out of guesswork.

At first thought, this system of record keeping might seem a bit bulky; but, on the contrary, it is very compact and convenient. Three black leather

binders are all that is necessary for containing the entire system. One binder is used for the Appointment and Day Book Record, which is kept handy on the secretary's desk. The second binder is used with alphabet index guides for the patient's account Record. The third binder with suitable index guides, to locate quickly the different records, is used for all other records. These last two binders should be kept in the safe for protection against fire.

Much can be accomplished through a careful study of each step of office routine to standardize and simplify operative routine, laboratory and technical procedures, business office administration. This will result in greater accuracy and the elimination of much waste time and effort. Henry Ford has defined efficiency as "the ability to do one's work better with less effort." It seems, therefore, that there is much in that thought of practical application to orthodontic practice.

Needless to say, if we are to attain the highest degree of efficiency in our offices, we must have adequate facilities for efficient production. Compact, conveniently planned offices of ample size are essential. A sufficient number of treatment rooms equipped in duplicate will save much time and eliminate much needless confusion. The business office should be provided with a standard secretarial desk, filing cabinets, safe, adding machine, and, if room permits, a storage cabinet for office supplies. The laboratory should be equipped with every facility for accurate and time-saving production.

Is it not true that the orthodontist's greatest sphere of usefulness lies in the use of his best efforts toward an improvement in the quality of service and an increase in the availability of service? Does it not seem logical that a more efficient management of all phases of our work is the most effective means of achieving this ideal?

The opportunity is ours—what will we do with it? We cannot stand still, we must progress. Stephan Girard once said, "No bank will ever be a success until it has a president who takes it to bed with him at night." It is exactly the same with our work. If we put little effort into our work, our reward will be small. But, if we put a full measure of creative effort into it, our rewards will be great. It calls for vision, inspiration, enthusiasm, study, thoughtful application, self-improvement, hard work and plenty of it.

So, let us remember our responsibilities, which carries with it not only a desire to serve but the opportunity to be of service and the developed ability to serve. Our reward will be better mental, moral, and physical health, more self-respect, greater respect of our fellow-men, larger financial rewards, the realization of an ideal, and the greatest degree of true happiness.

333 Linwood Ave.

# TREATMENT OF A UNILATERAL DISTOCLUSION CASE WITH AN EXTREME OVERBITE

RICHARD A. SMITH, D.D.S., EVANSTON, ILL.

*HISTORY and Attributed Etiology.*—The patient, a girl ten years of age, presented for treatment in August, 1931. The malocclusion was a unilateral distoclusion complicated by an extreme overbite. Her weight, height, and general development were normal for her age. No constitutional dis-

Fig. 1. Fig. 2.

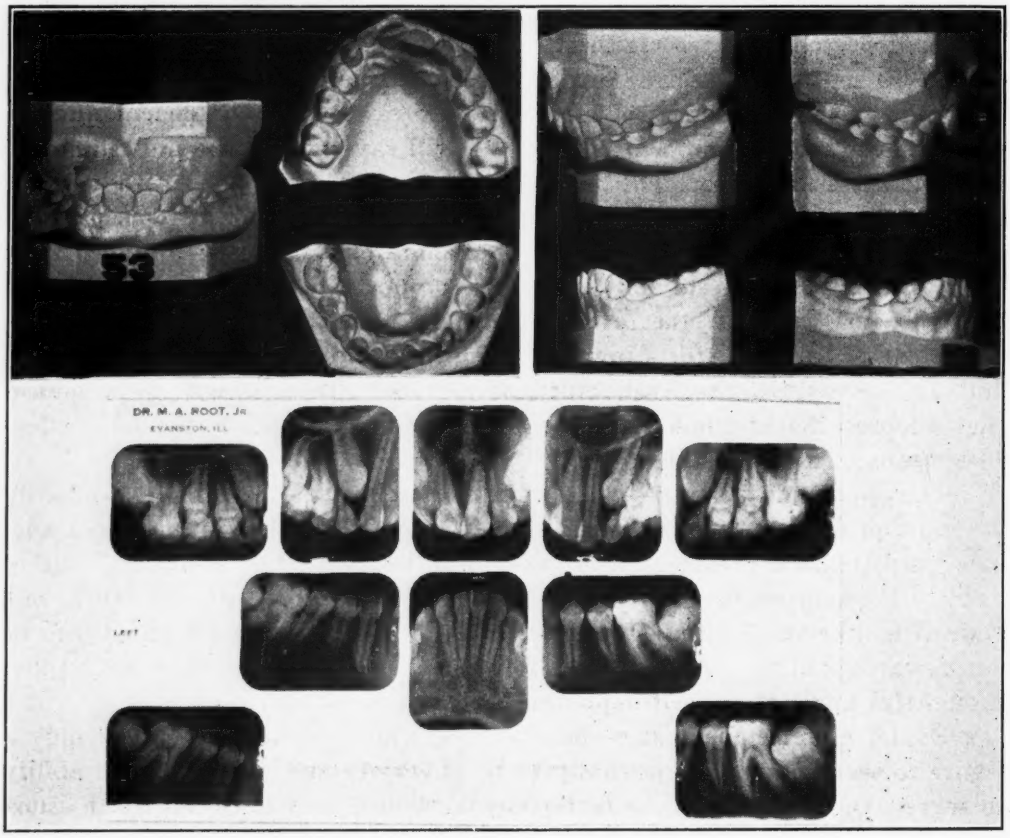



Fig. 3.

orders had been experienced except the ordinary childhood diseases. The adenoids and the tonsils had not been removed. Respiration was normal. The mother's teeth were regular and in good occlusion. The father had a bad malocclusion similar to the child's. On questioning, the mother gave a history of a leaning habit in which the child rested the left hand against the left side of the mouth while reading. Inasmuch as a considerable part of the child's time was spent in reading, it was thought to be a possible etiologic factor.

Presented at the Thirty-Fourth Annual Meeting of the American Society of Orthodontists, St. Louis, April 20-23, 1936.

Fig. 1 shows the front and occlusal views of the case. Note the extreme overbite in the incisor region. In the occlusal views note the lingual displacement of the mandibular and maxillary incisors on the left side.

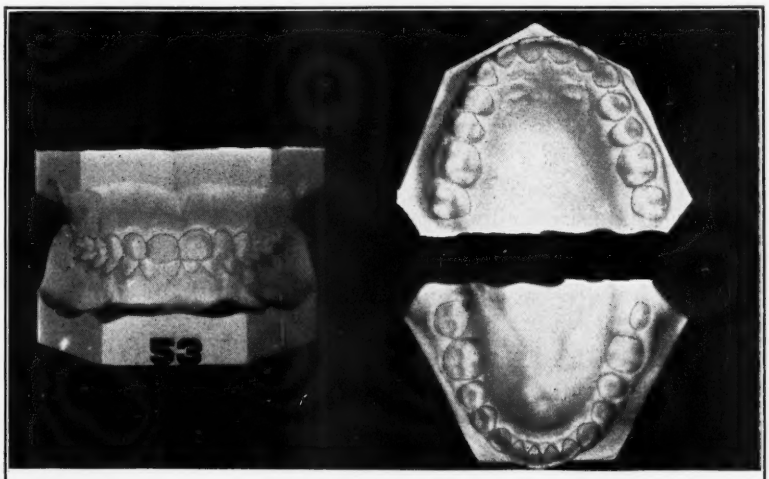


Fig. 4.

Fig. 5.

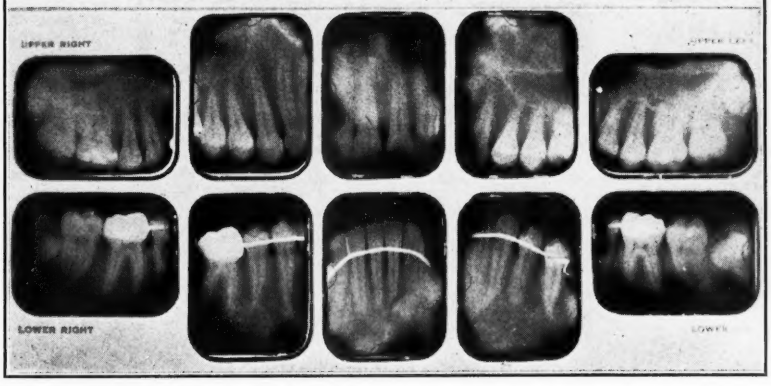



Fig. 6.

Fig. 2 shows the right and left lateral views. The mesiodistal relationship is normal on the left side and is in Class II or distoclusion on the right side. Note the exaggerated curve of Spee in the lateral views of the mandibular model.

Fig. 3 shows the x-ray pictures at the beginning of treatment. The permanent teeth are all present, and tooth development seems to be normal for the age of the patient.

*Diagnosis.*—This case was classified as a Class II Division 2 Subdivision (Angle). In my opinion, the extreme overbite was due to a supraversion of both the maxillary and the mandibular incisors. On the left side, the maxillary and the mandibular incisors and cuspids were in linguoversion.

The necessities in treatment were to move the maxillary and the mandibular incisors and cuspids labially and to depress them; also, to correct the arch relationship on the right side.

*Treatment.*—Bands were placed on all the first permanent molars. In the maxillary arch, the incisors were banded. In the mandibular arch, the incisors and the cuspids were banded. McCoy open tubes were soldered on all attachment bands. A labial arch with a 0.022 anterior section, to engage the McCoy open tubes, and a 0.040 posterior section was used. Loop springs 0.022 in diameter were soldered to the labial arch wire just anterior to the buccal tubes to exert forward pressure on the incisors. These appliances were used to move the maxillary and the mandibular incisors forward and to depress them. When normal arch form was approximated, intermaxillary elastics were worn on the right side day and night and on the left side at night only until the arch relationship was corrected.

Fig. 4 shows the front and occlusal views of the completed case. Fig. 5 shows the right and left lateral views. A lateral view of the mandibular cast shows the change in the curve of Spee. Fig. 6 shows x-ray pictures of the completed case.

*Retention.*—In November, 1933, the patient was taken off active treatment and a plain lingual appliance placed on the mandibular arch. The treatment appliance was used as a retainer in the maxillary arch for nearly a year. This was used so that the maxillary cuspids, which were just beginning to erupt, could come into place without interference. Because the patient objected to the attachment bands, a Hawley retainer was substituted at this time, although the cuspids were still not fully erupted. This retainer was worn continuously for one year and now is being worn at night only. The maxillary cuspids have been very slow in erupting, and I believe that the bow from the Hawley retainer has interfered some in their positioning. When the retainer is discarded permanently, I believe that the positions of both maxillary cuspids will improve.

636 Church Street

# MUTILATED CASE IN WHICH EARLY ORTHODONTIC INTERFERENCE PREVENTED AN OTHERWISE HOPELESS DEFORMITY*

HUGH GRUN TANZEY, D.D.S., KANSAS CITY, MO.

IN REPORTING this case, your attention is called to several vital, if not interesting, points.

A lad eleven years of age, robust, with loss of all maxillary incisors, and considerable process, resulting from horse kick, some months previous; three children in the family, in very modest circumstances, apparently without perspective. (Figs. 1 and 2.)

While I had treated numerous mutilations involving loss of central incisors, lateral incisors, or some of the multi-cusp teeth, I had, in over thirty-five years of orthodontic experience, never had the opportunity to attempt a case with the four maxillary incisors missing; so I accepted the challenge, consequences, and financial non-imbursement, notwithstanding. I thought conditions generally were favorable.

Estimate time: two years plus, including observation (meaning post-operative supervision, or getting gracefully out after doing our best). To date it is over five years, and we must hold out for the "wisdom teeth." We pronounced it a Class I (mutilated, neutroclusion), knowing that with the slightest provocation it would skid into a Class III (anteroclusion case).

Fourth grade, school. Oral health: excellent, no caries, no fillings, gums healthy. This record stands after five years. General health: good. Nasal passages: tonsils and adenoids removed.

Practically all the deciduous teeth except the incisors were firmly retained.

August 20, 1930, modelling compound impressions were taken with bands on first permanent molars, after which the patient was referred for x-ray examination (Fig. 3), full mouth and photograph, customary routine; was presented with a toothbrush and dentifrice and given instruction for prophylactic measures.

August 27, placed maxillary appliance, which we termed a palatine triple loop fixture (a graceful thing without much else to recommend it); 0.040 wire construction soldered to the first permanent molars, extending distally toward the second molars in a switch-back for a long, steep loop into the palate with lateral tapering arms extending mesially to the canines. Time: three hours forty minutes.

This particular type of appliance was selected with the hope that gentle persuasive expansion of the maxillary arch would permit the unerupted teeth

*From the Clinic of the International School of Orthodontia.

Presented at the Thirty-Fourth Annual Meeting of the American Society of Orthodontists, St. Louis, April, 1936.

to drift forward in the process of dentition (but they did not). I hoped to carry on with monthly visits from the patient; in this I almost succeeded. I juggled this triple loop appliance for about sixteen months; much of this

Fig. 1.

Fig. 2.

Fig. 3.

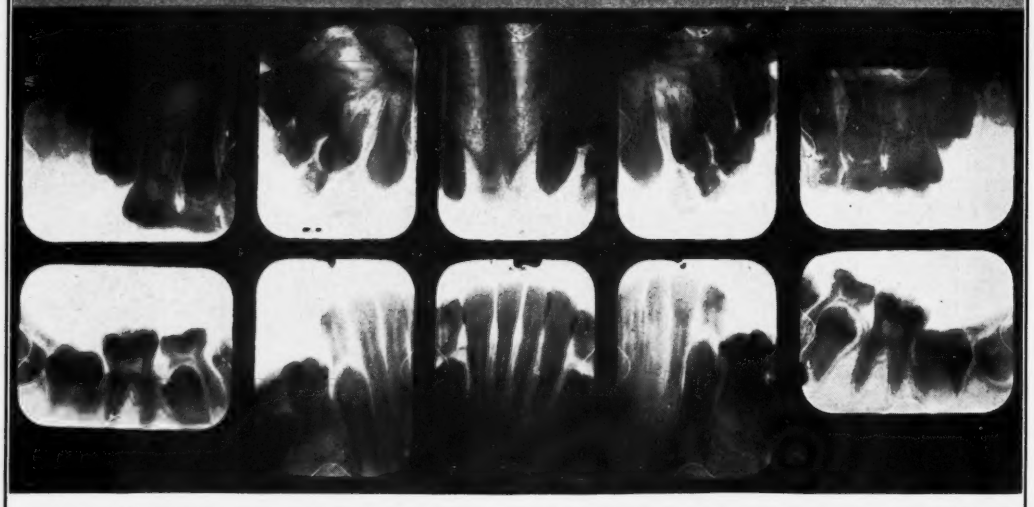


Fig. 4.

Fig. 1.—Casts made several months after permanent incisors were lost.

Fig. 2.—Photographs showing early esthetic effects due to loss of incisors.

Fig. 3.—X-ray photographs showing position of unerupted teeth, soon after the accident.

Fig. 4.—Occlusal view of cast showing maxillary triple loop lingual, fixed appliance, used to start treatment; results obtained after sixteen months.

time it was almost completely out of control. (There were eighteen visits in sixteen months, averaging twenty-three minutes. A lot of expansion and new teeth.) (Fig. 4.)

December 31, 1931, placed maxillary labial arch, spur bands on right and left first premolars with ligatures engaging spurs on bands and hooks placed well forward on labial arch in attempt to lead the premolars and push the canines mesially. They were reluctant to assume this desired position. Time required for construction and placing this appliance, two hours fifteen minutes.

February 24, 1932, placed mandibular appliance, bands on first permanent molars with buccal tubes, lingual bars and plain labial arch with loop stop springs to engage buccal tubes.

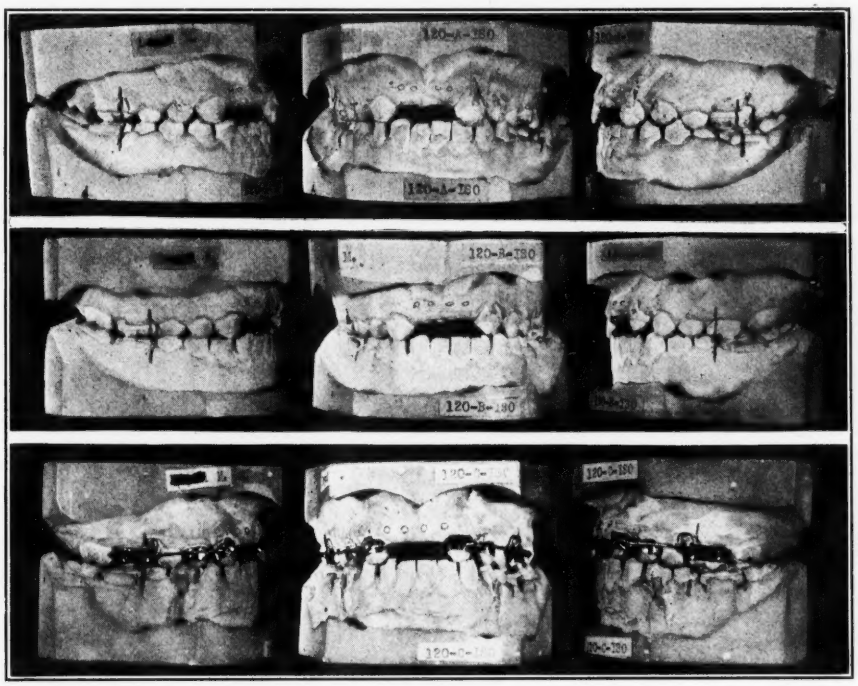


Fig. 5.

Fig. 6.

Fig. 7.

Fig. 5.—Results after two years' treatment.
Fig. 6.—Showing the improvement made, especially in the molar region.
Fig. 7.—Showing entire maxillary appliance used.

August 11, 1932, removed labial arches, modelling compound impressions for study (Fig. 5).

September 10, 1932, placed Baker hooks on mandibular labial arch and instructed patient to wear intermaxillary elastics continuously. The years 1931-1932 were not altogether uneventful, for while we were struggling along with these simple appliances, incidents varying from slightly humorous to moderately aggravating were taking place, and nature was doing her part producing new teeth just back of where we wanted them (in the maxillary arch).

February 24, 1933, bands were placed on the maxillary canines with hooks (T clasps) to engage the labial arch, and for ligature attachments.

Fig. 8. Fig. 9.

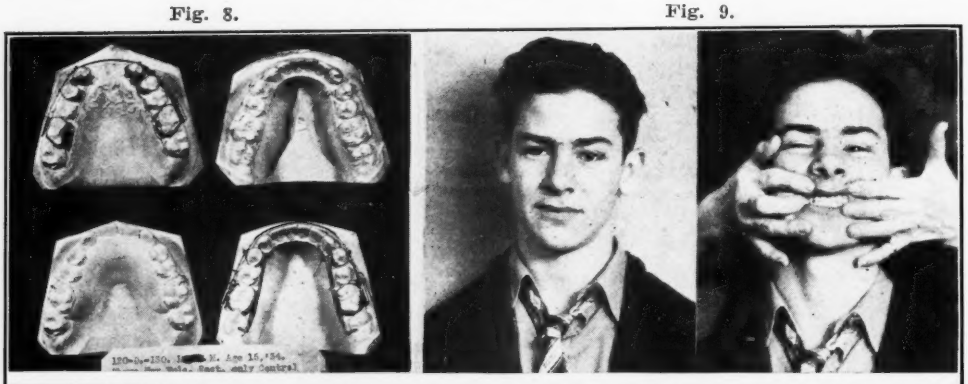


Fig. 10.

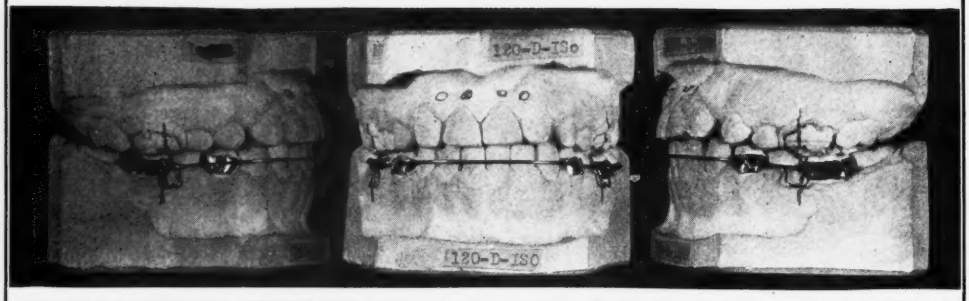



Fig. 11.

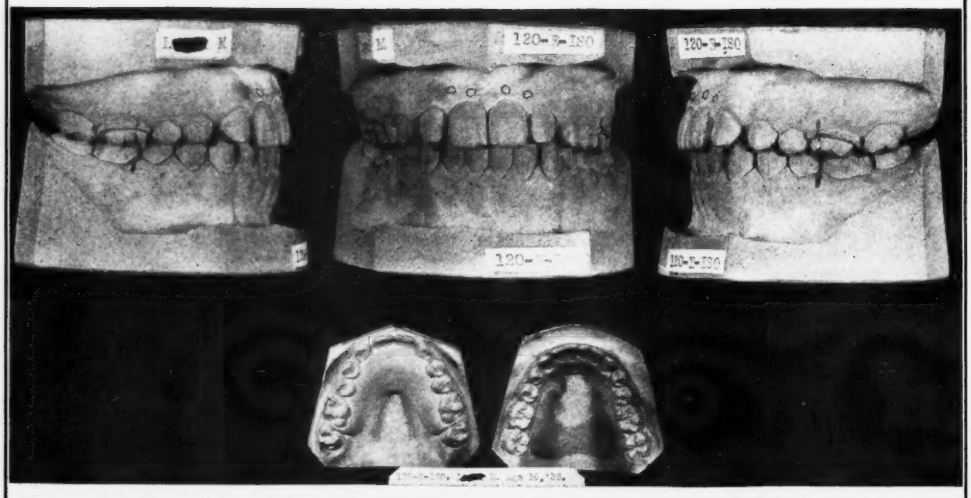
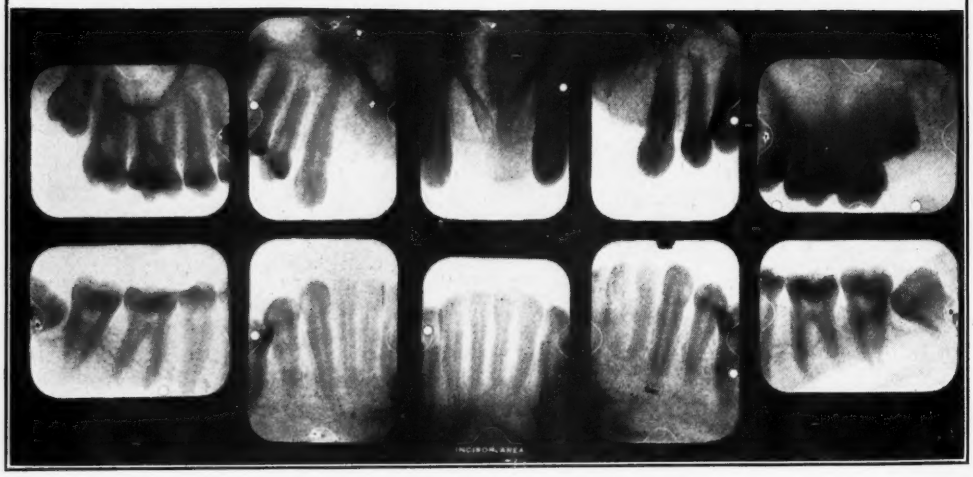



Fig. 12.



Figs. 8-12.—See opposite page for legends.

August 19, 1933, near the close of the third year of the campaign, both labial arches were removed and modelling compound impressions were taken. (Our customary procedure calls for study casts once a year, whether we are getting desired results or not. Of course, in the event we obtain spectacular results, we slip over extra impressions and thereby get a "rise" from our laboratory assistant.) (Fig. 6.) Three days later bands were placed on the maxillary right and left first and second premolars with closed buccal tubes, short, and a 0.022 steel wire arch was adjusted near ideal in shape, slightly expanding. A wire lacing from buccal tube on the first molar band, around this small arch to the buccal tube on the opposite molar band, introducing tandem compound reciprocal anchorage (semicircular) was intended to lead all the teeth forward toward the median line. (Fig. 7.)

October 21, 1933, started using intermaxillary elastics on right side from a spur on the maxillary labial arch to a similar spur on the right mandibular lingual bar in an effort to reinforce anchorage on left side, while correcting adjustments toward the median line.

July 27, 1934, both maxillary and mandibular labial arches were removed for impressions, after which the maxillary arch was replaced, slightly expanding, and the mandibular labial arch was left off. During the intervening months frantic efforts were made in attempts to gain closer cusp relationship between the teeth of the opposing jaws.

August 24, 1934, placed a mandibular lingual arch, soldered to the first permanent molar bands, the distal ends of the arch resting on the occlusal surface of the second molars between the mesial and the distal lingual cusps, as shown in Fig. 8. I can heartily recommend this procedure with most of the mandibular lingual arches, fixed or removable. We use very few of the latter.

August 31, 1934, a mandibular plain labial arch was replaced resting on T clasps of the first premolar bands, with stop springs engaging buccal tubes on the first permanent molar bands. Intermaxillary elastics were placed engaging post on lingual bar upper left to buccal tube and stop spring on the lower. We were also using intermaxillary elastics on right side from buccal tube on the maxillary to post on the mandibular lingual arch, elastics both sides crossing occlusal surface of teeth between the arches. I am inclined to believe it is advisable in all cases in which the bite is to be shifted laterally, to employ intermaxillary elastics on both sides simultaneously.

April 20, 1935, maxillary appliance, including all bands, was removed, modelling compound impressions taken with first molar bands in position for vulcanite maintenance restoration.

April 25, 1935, placed vulcanite maintenance restoration with central incisor plate teeth filling the space formerly occupied by four incisors. The

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Fig. 8.—Occlusal view of maxillary appliance and of mandibular lingual appliance.

Fig. 9.—Showing photograph of restoration with only central incisors.

Fig. 10.—Showing maxillary restoration with stabilizing molar bands. Mandibular treatment appliance.

Fig. 11.—Casts showing vulcanite restoration, central incisor plate teeth. Patient dismissed.

Fig. 12.—X-ray pictures showing condition of teeth at time patient was dismissed.

buccal tubes and lingual bars had been removed from the molar bands and lugs soldered to the distobuccal angle of bands near the gingival to engage clasps extending over the marginal ridges mesial to the molars for stabilizing the fixture. At this time the patient was referred to the photographer for a record picture (Fig. 9).

June 5, 1935, modelling compound impressions of maxillary and mandibular, with appliances in position. The mandibular treatment appliance was left off at this time, and both are shown in Fig. 10.

June 26, 1935, the case was demonstrated to the International School of Orthodontia students.

July 31, 1935, observation.

September 28, 1935, patient came in with plate tooth broken, which was temporarily cemented on. The molar retaining bands were removed and impressions taken for a new vulcanite plate. The molar bands and the old plate were replaced temporarily to insure against migratory teeth.

December 13, 1935, placed the new vulcanite retaining plate with no stabilizing bands, clasps of steel 0.036 were used crossing from vulcanite over marginal ridges, and between molars. Impressions were taken for records, and patient was referred for x-ray examination. (Figs. 11 and 12.)

Patient was discharged, although he will be recalled periodically to observe the effect of the unerupted third molars. So many changes and adjustments were made, and so many different materials and attachments were used (all of which we can highly recommend, if properly used) with many times such little favorable results, that I have hesitated to mention more than the major items, although every detailed effort in the treatment has been of interest to me. The cooperation was good; there were no inexcusable failures in appointments—no complaints from patient or parents. Perhaps there was a bit more dislocation of parts due largely to the fact that the teeth were fairly comfortable, no ordinary use was denied them at any time—some of the apparent lost action could have been laid to associates but for the fact that I had command at all times, and most of the ineffectual innovations introduced in the treatment I personally executed. It can be truthfully said that I was so glad to conclude this bit of research that I am not inclined to look through the "hind sights" for bright ideas to recommend to my contemporaries.

# Department of Oral Surgery

Edited by

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## MANAGEMENT OF THE LYMPHATIC AREAS TRIBUTARY TO ORAL CANCER

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AT THE present time what to do with the regional lymphatics is the main point of contention in the treatment of epithelioma in and about the oral region, and this is especially true in carcinoma of the lip. For the past twenty-five years the removal of the immediate tributary lymph nodes en bloc whether or not the nodes were palpable has been the method of treatment in most surgical clinics. Recently, however, certain workers have adopted what they call a more conservative method of handling the tributary lymphatic areas. They argue that in cancer of this region, and in lip cancer especially, a large proportion of cases seen without metastasis will remain free and that it is not justifiable to subject all patients routinely to a major operation for the purpose of removing the tributary lymphatics before they are clinically involved.

Pertinent to a discussion of the management of lymphatic areas tributary to oral cancer is a knowledge of the method by which the glands do or do not become involved. At present it is generally agreed that emboli of cancer cells are carried to lymphatic glands and are there held up where they again take on unrestrained growth characteristics.

The opinion that buccal carcinoma metastasizes principally by cell emboli, not by permeation, is supported by three lines of reasoning: first, microscopic sections between the site of the lesion and the glands do not show evidence of invasion; second, first involvement of a node may be more distant than the nearest connecting one; third, the nodes may be invaded when the local lesion is still very early and small.

The submental, the submaxillary, the superior deep cervical, and the inferior deep cervical are the main tributary groups of nodes which need consideration. The infrahyoid node, the buccal node, a node lying near the

This is the ninth of a series of articles upon the subject of malignancy in and about the oral cavity. All phases of the subject are to be included.

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lower end of the anterior belly of the omohyoid muscle, a few nodes between the hyoglossus muscle and a node superior to the mylohyoid muscle are other nodes of some importance.

For purposes of discussion, one may consider the treatment of the regional glands of the neck under three headings, depending on the stages of the disease: (A) when the glands are not palpable; (B) when the glands are palpable but not fixed; (C) when the malignant cells have evidently broken through the gland capsule or the metastasis is bilateral.

### WHEN THE GLANDS ARE NOT PALPABLE

Those adopting the so-called conservative attitude, treat the local lesion, irradiate the neck by one type or another of external irradiation, and wait developments as to the glands while attempting to keep the patient under observation. When palpable nodes develop, a bloc dissection of the neck is performed. This group has maintained that up to a certain point the lymph nodes perform a conservative function and tend to limit the growth of malignant cells, a conception which has, however, never been proved. They advance the argument that the disease can be dealt with as efficiently when a gland becomes palpable as before it becomes palpable. Moreover, they assume that the patient can be followed for a period of several years—sometimes an unattainable ideal. This school maintains also that it is the exception rather than the rule to cure any patient with malignant cervical glands. They recommend that prophylactic irradiation be the routine when the glands are not palpable. They point to the number of operations that may be done uselessly, minimize the difficulty of following the patient for a number of years, do not stress the number of deaths due to enlarged nodes getting out from under control while a procrastinating regime is being pursued.

On the other hand, another group, and the one which I favor, has been unable to accept this newer conception and still advocates in most instances of unilateral radio-resistant squamous cell carcinoma a bloc dissection of the area of the neck most likely to be involved, sometimes at the time of the destruction of the local lesion but more often after elapse of a varying period of time sufficient for the patient to recover largely from the therapy delivered to the local lesion.

The facts necessary to settle this dispute are difficult to obtain. Various groups of statistics as to the percentage of metastasis that eventually appears after the local lesion is healed vary, as would be expected. The rate of growth, the character of the growth, the extent of the growth, and the anatomic location all have a bearing on the likelihood of metastasis eventually appearing in the neck. Even if we had exact and accurate statistics concerning the exact percentage of healed local lesions for a given region that eventually developed metastatic carcinoma, taking all patients as they come, the question of individualization of patients would enter. It is reasonable to expect the likelihood of metastasis in early relatively quiescent local lesions to be much less than in more active and more advanced local lesions. Clinical observation has always borne out this assumption.

Some discussion of the value of prophylactic irradiation if one advocates not performing a neck dissection until palpable nodes appear is pertinent. According to present conceptions prophylactic external irradiation is insufficient to be lethal for relatively adult squamous cell epithelioma. So far as a permanent cure is concerned, it is most likely that sublethal dose of irradiation will not produce an appreciable effect upon the ultimate recurrence rate. However, although we have little definite proof, prophylactic external irradiation probably produces changes which tend to slow up the growth of epithelioma after it has reached the lymph nodes. As advantageous as an impediment to growth may be, such is considerably different from a cure.

We have no clinical method of knowing whether or not the lymph nodes are microscopically involved. For a given lesion we can only go on probability. A node is involved with cancer cells for an indefinite period of time, depending upon the type of original lesion, before it becomes clinically palpable. Among the evidence that might guide one is the statistics of the number of patients with a given type of lesion in a given location in which the local lesion is healed and no palpable nodes are present, but in whom eventually neck metastasis develops. There is at present a considerable amount of clinical experience and statistical data to give a general idea based as to probabilities. The only difficulty with this line of reasoning is that when one gets the probabilities for the group down to a fair degree of accuracy, in a given case he may be wrong.

One is warranted in individualizing to a certain extent. When the chances are good that metastasis will not occur and it is certain that the patient can be followed, one is probably correct in following a conservative course. On the other hand, if the chances are relatively high that metastasis will appear and the chances of one's following the case often enough are poor, one would be justified in a more radical method of procedure.

1. *Percentage Who Develop Palpable Nodes During Treatment of the Local Lesion.*—A point of interest is the number of cases that do eventually show metastasis after the local lesion is obliterated in a given region.

Duffy (1927) studied the 1917 to 1924 series of cases at the Memorial Hospital. All cases were observed at least two years. In the case of carcinoma of the lip, at least, this is too short a period, but in some of the other situations it is of more significance. Of 233 cases of lip carcinoma without palpable nodes, 210, or 90.1 per cent, showed no nodes throughout the period of observation; 39, or 18.6 per cent, developed nodes that proved to be inflammatory on section; 23, or 8.5 per cent, developed regional metastasis after admission. Of 194 cases of carcinoma of the tongue, admitted free of metastasis, 117, or 60.3 per cent, did not develop nodes throughout; 33, or 28.2 per cent, developed inflammatory nodes; and 77, or 28.7 per cent, developed metastasis after admission. Although such data tell one something in a certain sense, in another they do not, as nothing specific concerning the type of the local lesion is given. Table I shows Duffy's figures for all locations in the region.

If Duffy's figures may be taken as correct, it would appear that on an average all patients as they come and go with carcinoma in or about the buccal region undergoing treatment for the local lesion and without palpable nodes in the neck have from 10 per cent chance with carcinoma of the lip to 30 per cent

chance with carcinoma of the tongue of developing metastasis after the local lesion is healed. However, in a given case of carcinoma of the lip with a rather well-developed local lesion, the individual's chance of eventually developing metastasis might be as high as 30 per cent, or a similar carcinoma of the tongue as high as 60 per cent. On the other hand, a small lower grade carcinoma of

TABLE I

| PRIMARY | CASES ADMITTED WITH NO NODES | NO NODES THROUGHOUT | PER CENT OF PATIENTS WITH NO NODES ON ENTRANCE WHO DID NOT SHOW NODES THROUGHOUT |
|---|---|---|---|
| Lip | 233 | 210 | 90.1 % |
| Tongue | 194 | 117 | 60.3 % |
| Floor of mouth | 77 | 54 | 70.1 % |
| Mandible | 65 | 55 | 84.6 % |
| Maxilla | 54 | 45 | 84.3 % |
| Hard palate | 26 | 24 | 92.3 % |
| Soft palate | 26 | 20 | 77.0 % |
| Buccal mucosa | 74 | 59 | 79.7 % |
| Tonsil | 56 | 40 | 71.4 % |
| Antrum | 54 | 46 | 85.2 % |
| Larynx int. | 77 | 73 | 94.8 % |
| Larynx ext. | 47 | 43 | 91.5 % |
| | 983 | 786 | 79.95% |

the lip might have practically no chance of eventually showing metastasis. In the latter case, the same to a lesser extent may be said of a small early carcinoma of the tongue.

2. *Percentage of Bilateral Metastasis.*—Another feature of Duffy's paper worthy of our perusal is the number of bilateral metastasis (Table II).

TABLE II

| | SAME SIDE | OPPOSITE SIDE | BOTH SIDES |
|---|---|---|---|
| Lip | 40 | 3 | 9 |
| Floor of mouth | 42 | 2 | 24 |
| Mandible | 21 | 2 | 5 |
| Maxilla | 12 | x | 3 |
| Hard palate | 3 | 2 | 2 |
| Soft palate | 4 | x | 7 |
| | | | (14 cases) |
| Tonsillar region | 68 | 6 | 5 |
| Antrum | 13 | x | 4 |
| Larynx (int. and ext.) | 48 | 1 | 22 |

The percentage of bilateral metastasis is interesting as showing the percentage of chance a unilateral neck dissection has of not being of value in the various locations enumerated.

3. *Results of Excision of Lymph Nodes After Involvement.*—The chances that a block neck dissection has of eliminating the lymphatic involvement, if it is present, is very pertinent.

Blair has 20 out of 74 (27 per cent) known involvement of the cervical lymph nodes by squamous cell epithelioma well five to seventeen years after excision en bloc (Fischel). Simmons in 48 cases radically operated has 23 in which the gland proved to show cancer; 17 per cent of these lived 5 years.

Fischel recently presented a series of cases of intraoral cancer (112 cases) with 70 per cent of the cases (including those with nonpalpable nodes—10 per cent) showing carcinoma as proved by the microscope in the lymph nodes. Neck dissections were done on all patients. He had 10 patients without palpable nodes, 7 of which showed carcinoma on microscopic examination after neck dissection; 33 per cent of these lived five years or more. Of the remainder with palpable nodes and microscopically positive 13.8 per cent lived five years or more. In metastasis from carcinoma of the lip the percentage of nonrecurrence is greater than that for intraoral cancer.

4. *Value of External Irradiation of Lymphatic Areas.*—As to the value of prophylactic external irradiation, the following observations by Shreiner and Mattick are interesting as having a bearing upon the likelihood of its being of value.

Shreiner and Mattick present some interesting statistics of nonpalpable lymph nodes treated by irradiation. They divide their cases into small local lesions and large local lesions. In half of each group no irradiation was given to the lymphatic areas, and in the other half intensive prophylactic irradiation was given. They obtained exactly the same percentage of five-year cures in the group in which the lesions were only treated locally as in the group in which the neck was also irradiated; namely, about 85 per cent small local lesion group cure and 58 per cent cure in the large local lesion group.

5. *Clinical Diagnosis of Palpable Glands.*—Most observers have concluded that there is a rather high percentage of inaccuracy both ways in trying to distinguish whether a palpable node in the neck is involved by cancer or is enlarged by inflammatory products. For example, Simmons in 22 cases of gland palpable clinically found that 12 proved to be cancer and 10 proved not to be. In 20 cases with no glands palpable 7 proved to be cancer and 13 proved not to be cancer when examined microscopically. Lund in 32 small gland cases found that 16 proved to be cancer and 17 proved not to be. Fischel in 112 cases had only 10 of these showing nonpalpable nodes, and 7 of these proved to be involved with carcinoma; 24 of the 112 had palpable glands but did not prove to be involved with cancer on excision.

6. *Microscopic Grading of the Local Lesion.*—Although all observers are not agreed, the majority, I believe, admit that the likelihood of group four (Broders) being successfully treated by radical bloc dissection is quite small. For example, Simmons in (Group IV) 15 cases had no cures. Most students of the question agree that in lymphoepithelioma and transitional cell and the various radiosensitive types of epidermoid carcinoma practically no good results are given after neck dissection. On the other hand, for the time being, at least, irradiation affects such types very favorably, and theoretically a sufficient dosage can be given to be lethal for metastatic tumor cells. But, if the surgeon is going to place some reliance upon the cellular type and microscopic grading so far as treatment is concerned, the pathologist must be experienced enough in the study of this type of tumor to be able to make an estimate with a fair degree of accuracy.

7. *The Size or State of Advancement of the Local Lesion.*—Besides the microscopic grading of local lesion the size and state of advancement of the

local lesion are important in the consideration of whether or not a neck dissection is indicated. All series of cases will vary according to the size of the local lesion. For example, in carcinoma of the lip treated surgically with routine neck dissections performed, Kennedy (147 cases) found that 88 per cent of the patients with lesions up to 1.5 cm. were alive and well, 67 per cent of those with lesions between 1.5 cm. and 3 cm. and 44 per cent of those with lesions over 3 cm. in size.

No valuable statistics can be presented to compare the size of the local lesion and its state of advancement with the increased percentage of lymphatic metastasis which eventually appears; but no observer with any great experience would deny that the chances of metastasis, even if the glands are not palpable, increase proportionately as the state of advancement of the local lesion is increased.

8. *Mortality of Neck Dissection.*—The mortality of a neck dissection alone carried out under local anesthesia should not be over 2 or 3 per cent in this class of patients, and in selected cases it should be lower than this.

The submaxillary dissection used in lip carcinoma will run a lower mortality percentage than the complete unilateral bloc dissection. However, as cancer is a 100 per cent deadly disease, I do not believe one should select his case with an eye on his mortality statistics. In a group of cases in which some chance of cure is offered one is justified in taking a chance if it is not too much of a forlorn hope. The mortality depends to a considerable degree upon the time when the neck dissection is done. When one attempts to do the neck dissection at the time of excision of the local lesion, or before the patient gets in fair condition after treatment of the local lesion, the mortality will be raised. In the feeble and very old if one leans toward the conservative side somewhat, the mortality tables for any group of cases will appear better.

9. *Conclusion in Regard to Nonpalpable Nodes.*—Finally after sifting all the evidence, one can say, I believe, that although the number of patients without palpable nodes in the neck who will show metastasis after the local lesion is healed is smaller than once was thought, and although the percentage of cures after removal of carcinomatous glands is somewhat less than has been stated at times in the past, and considering that prophylactic irradiation in the metastatic adult squamous cell carcinoma is as yet not of proved value along with the well-known 100 per cent fatal result of uncontrolled metastasis, one is not warranted in routinely adopting a procrastinating regime. Such a regime can only be justified where the chances of metastasis are slight, or where the type of local lesion suggests that the lesion is radiosensitive. Whether or not one has the patient under the most careful type of observation and control is also an important item. When one heals the local lesion only and then allows the patient to get out from under strict observation, he has done the patient a much greater injustice than if he did a neck dissection which raised his chances of a cure from 10 to 20 per cent according to the location and type of the lesion with a risk of only 2 or 3 per cent on the operation.

A logical position for one to take might be designated as a "three-quarter way" position from routine neck dissection on nonpalpable nodes. From routine neck dissection in adult squamous cell epidermoid carcinoma it eliminates, on

the one hand, the early small lesions with adult cellular characteristics and, on the other hand, certain rapidly growing pleomorphic anaplastic lesions which have been shown to be affected somewhat favorably by irradiation methods, and unfavorably by surgical excision. This position also takes into consideration whether or not the patient will present himself for competent observation over a period of years, whether or not the patient is intelligent, and whether or not he is handicapped because of distance, economic factors, or noncooperation.

### WHEN THE NODES ARE PALPABLY ENLARGED BUT FREELY MOVABLE

When the lymph nodes are palpably enlarged but freely movable, most workers are agreed that the method of choice is bloc dissection, unless growth is thought to be clinically, or can be diagnosed microscopically, or shown by the therapeutic test to be radiosensitive. Then excision of the glands is not justifiable, but otherwise bloc dissection is the method of choice.

Some conservative workers take the stand that the grade of the primary lesion in the buccal cavity should not influence for or against neck dissection. Unless the work of Broders and Ewing is entirely incorrect in regard to radiosensitivity, this stand is not correct. The radiosensitive types by a combination of clinical and microscopic study can usually be distinguished and in the radiosensitive types bloc dissection is probably of little or no value.

After bloc dissection it may be advisable to lay radium in areas in which one suspects that carcinomatous cells might remain. Preoperative irradiation of the enlarged nodes has only one argument in its favor, that viable carcinoma cells are possibly not so likely to be implanted when the neck dissection is done as otherwise. Preoperative irradiation to an extent bordering on theoretical lethality causes a fibrosis which makes a node dissection almost an impossibility. Although postoperative irradiation has not been proved to be of value, it is very often given after removal of the enlarged nodes. At least no one argues that it does harm when properly given. It may save a few cases or prolong life in other instances.

### WHEN THE MALIGNANT CELLS HAVE EVIDENTLY PENETRATED THE CAPSULE OF THE GLAND OR THE METASTASIS IS BELATED

1. *When the Capsule of the Lymph Node Is Perforated.*—Some workers have laid down the criteria that when there is evidence that the capsule of the lymph node is perforated neck dissection is a useless procedure. This is not entirely true. It must be admitted that immediately after the capsule of the gland is perforated the chances of a cure have greatly diminished, but they are not entirely gone. Whether or not a neck dissection will offer anything depends upon the type of tumor and to what it is fixed. When the metastatic mass is free from the carotid artery and has not involved bone to any great extent beyond the possibility of complete destruction or excision of all the bone likely to be invaded by cancer cells, a neck dissection may still offer the patient more than interstitial irradiation both by the way of a small chance of a cure and by the way of palliation. The mere fact that carcinomatous cells have perforated the capsule of the lymph nodes is not entirely the criteria for judging the limits of operability by neck dissection.

For those more advanced examples in which the carcinomatous glands are fixed to the carotid arteries, have involved bone not possible to remove or widely invaded the soft tissues, interstitial radiation plus heavy external irradiation offers a certain amount of palliation. It is the preferable way of handling this distressing and all too common situation and when accuracy of application is desired, it may be wise to expose the glandular areas surgically and under direct vision apply the radium interstitially. The rather peculiar conception, which has also some advocates, of picking out isolated glands in which to insert foci of radium seems rather far fetched. It suggests the needle in the haystack aphorism.

2. *Bilateral Glands.*—Bilaterally enlarged glands are not always hopeless, although usually so. We believe that here again the location and the type of the original lesion must be considered in the decision. In the more radioresistant lesions which may offer some chance when approached by bilateral operative measures, we see no reason to condemn the patient to the group listed for mere palliation until it is proved that he belongs to that category. When the original local lesion is located posteriorly in the pharyngeal or posterior buccal region, a location which tends to develop a more radiosensitive type and bilateral glands are palpable, intensive irradiation is to be preferred, as operation offers practically nothing. But in epitheliomas derived from the lip especially and sometimes from regions in the anterior buccal cavity, bilateral gland removal may give the patient his only chance.

Thus, we believe that in this group a medium radical attitude toward the metastatic glands should be pursued making exceptions when the pathology of the region seems to indicate that the possibilities of irradiation are likely to be more satisfactory.

## CONCLUSION

The evidence has not yet been produced to warrant a complete change of procedure in regard to handling the cervical lymph nodes. One goes far enough when all attempts are made to select relatively radiosensitive metastatic lesions by clinical means and microscopic means from relatively radioresistant lesions. Many workers state that this cannot be done, but we believe that within broad limits some selection is possible and wise.

## BLOC DISSECTION OF THE NECK

To be of value a bloc dissection of the neck should be all that the name infers. Always when the glands are found to be involved, at least the next tributary group or groups should be removed; and often, if the patient's condition does not contraindicate, a total bloc dissection of the neck should be performed. Two types of bloc dissection are rather commonly used:

(1) Typical removal of the lymphatic tissue en bloc for carcinoma of the lip.
(2) Complete unilateral removal of the lymphatic area en bloc.

*Typical Removal of Lymphatic Tissues en Bloc for Carcinoma of the Lip.*—A typical neck dissection for carcinoma of the lip is a bilateral removal of the contents of both submaxillary and the submental triangles. (Figs. 1 and 2.) If

on either side the glands in the submaxillary space are found to be involved with cancer, at least the upper two-thirds (Fig. 3) of the upper carotid chain of glands along with the deep jugular vein should be removed, or at some later time the total bloc dissection on that side should be completed. If the upper deep cervical glands are involved with cancer a complete bloc dissection on that side of the neck should be done.

OPERATION.—Three-fourths hour before operation, the patient is given ¼ gr. morphine or its equivalent. The patient is placed on a suitable table with head thrown slightly back and to one side so as to give good access to the upper part of the neck and submaxillary and submental and upper deep cervical regions.

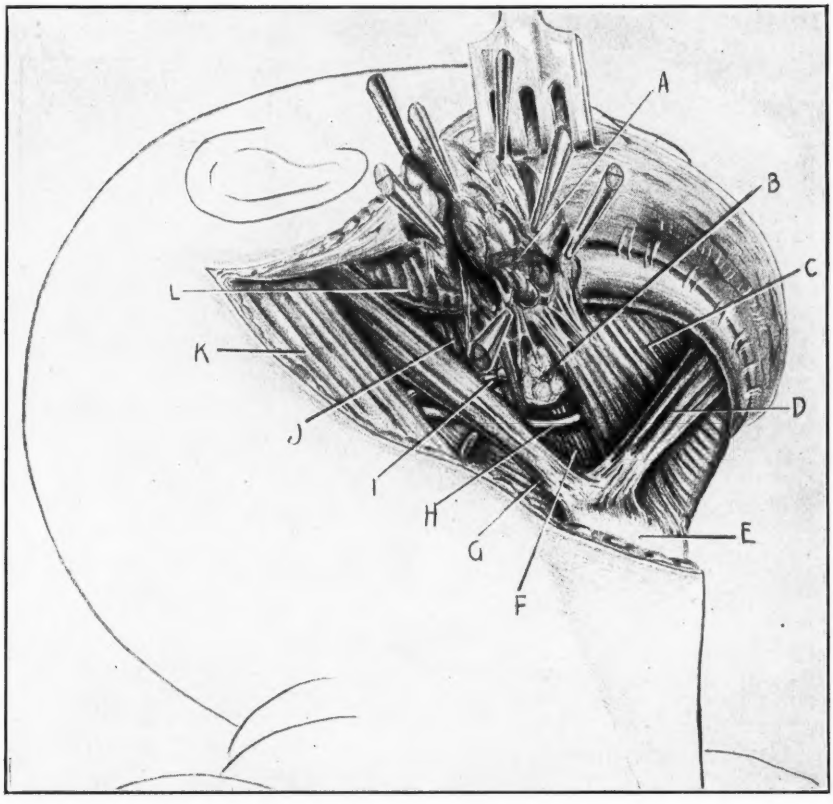


Fig. 1.—Lateral view of excision of tissue en bloc of the submaxillary and submental triangles. *A*, Submaxillary gland and areolar tissue of the submaxillary triangle; *B*, stump of submaxillary gland; *C*, mylohyoid muscle; *D*, anterior belly of digastric muscle; *E*, hyoid bone; *F*, hyoglossus muscle; *G*, posterior belly of digastric muscle; *H*, hypoglossal nerve; *I*, facial artery; *J*, hyoglossus muscle; *K*, sternomastoid muscle; *L*, masseter muscle.

The neck and chin regions are prepared. Novocaine ½ per cent with 3 or 4 drops of adrenalin to the ounce is infiltrated along the lower border of the mandible in the skin and subcutaneous tissues. The skin and the subcutaneous tissue over the submental and submaxillary areas and the upper deep cervical areas are infiltrated similarly. With a longer needle the tissues deep to the skin and up beneath the mandible are infiltrated. After a few minutes an incision is outlined with the point of the knife from the mastoid process forward downward to a point one-half inch below the greater cornu of the hyoid bone. From this

point the incision is continued to the midline and slightly past it upward toward the lower border of the mandible in the opposite submental region. Towels and towel clips are placed to isolate the field. The incision is deepened to just above the platysma myoides muscles. The skin flap is raised upward to just above the lower edge of the mandible. The external and anterior jugular veins are caught, crossout, and ligated just below the original skin incision. The attachment of the digastric tendons to the hyoid is exposed. Just at the lower edge of the mandible the platysma myoides is crossout. The facial artery and vein are caught and ligated as they cross the mandible and the anterior border of the masseter. Without injuring the periosteum the soft tissues attached to the edge of the mandible are loosened forward to the midline in the submental region and back to the sternomastoid muscle just below the lower tip of the ear. All tissue

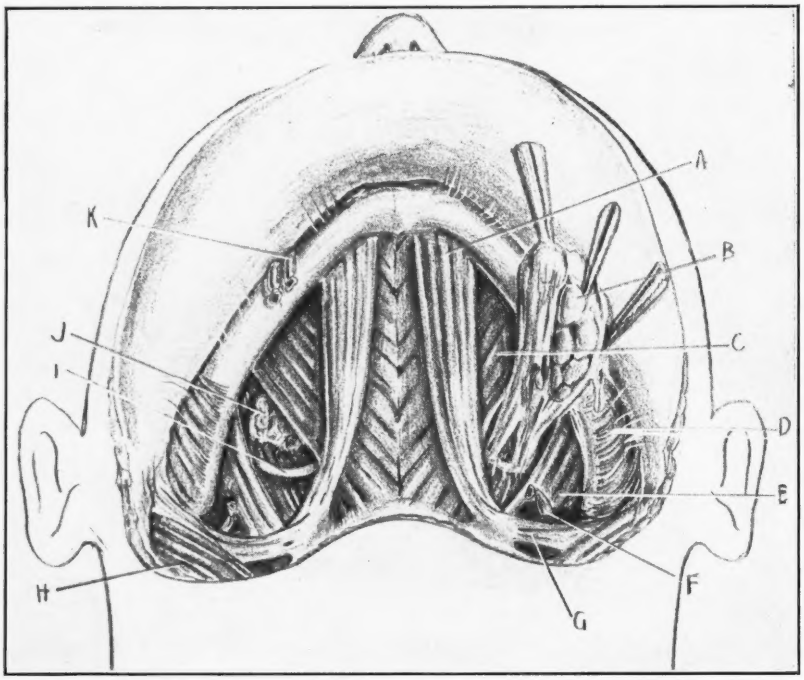


Fig. 2.—Front view of structures seen when the areolar tissues of the submaxillary gland and the lymph tissue are removed from both the submaxillary and the submental triangles. *A*, Anterior belly of digastric muscle; *B*, submaxillary gland; *C*, mylohyoid muscle; *D*, masseter muscle; *E*, hyoglossus muscle; *F*, stump of facial artery; *G*, posterior belly of digastric muscle; *H*, sternomastoid muscle; *I*, hypoglossal nerve; *J*, stump of submaxillary gland; *K*, stump of facial artery and vein.

down to and over the mylohyoid muscle is dissected backward and upward from the submental triangle. The contents of the submaxillary triangle are dissected upward. At the posterior border of the submaxillary triangle the facial vein is encountered, caught, crossout, ligated. The facial artery is encountered as it enters the submaxillary gland under the posterior belly of the digastric muscle. It is caught, crossout, and ligated. Thus, a flap is raised containing a mass of tissue normally found over and in the submaxillary triangle; and, as the fascia along the anterior border of the sternomastoid muscle is freed, the contents of the submaxillary are pulled upward. The submaxillary gland and all the surrounding tissue above and about the digastric muscle are removed, and the tissue

anterior to the upper part of the sternomastoid muscle is removed en bloc. The intraoral part of the gland is caught, crosscut, and ligated just where it disappears beneath the posterior border of the mylohyoid muscle. The smaller vessels of the neck which have been caught as the operation progressed are now tied. If the submaxillary lymph nodes show on cross-section grossly any evidence of cancer, the sternomastoid muscle is retracted and the glands from below the bifurcation of the carotid artery upward are removed en bloc as nearly as possible along with the internal jugular vein. If the submaxillary lymph glands show no evidence of involvement on cross-section, the upper deep cervical nodes are ordinarily not removed.

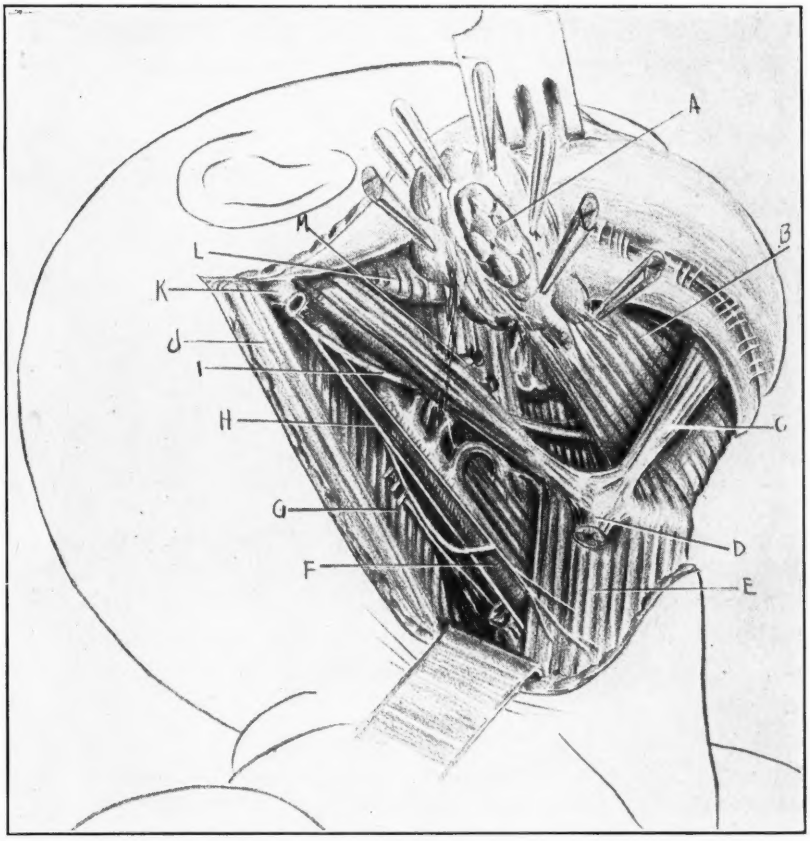


Fig. 3.—Diagram of submaxillary dissection of the upper deep cervical tissues when the submaxillary tissues show cancerous involvement of the lymphatic structures. The upper two-thirds of the carotid artery is removed along with the deep jugular vein. To do this the sternomastoid muscle is retracted backward and outward. *A*, Submaxillary gland and areolar tissue of submaxillary triangle; *B*, mylohyoid muscle; *C*, anterior belly of digastric muscle; *D*, stump of mylohyoid muscle; *E*, pretracheal muscle; *F*, common carotid artery; *G*, deep muscles of the neck; *H*, vagus nerve; *I*, hypoglossal nerve; *J*, sternomastoid muscle; *K*, upper stump of deep jugular vein; *L*, masseter muscle; *M*, stump of facial artery.

When the lip ulcer is near the corner of the mouth, only a unilateral neck dissection is performed. It is considered that the chances of cross metastasis are sufficient to warrant removal of lymphatic structures of both submaxillary triangles. Such a bilateral removal adds little to the risk, and the defect after the operation is scarcely noticeable.

Inclosure.—The skin flap is turned down. A small gauze pack is inserted to the submaxillary space and a similar one to the upper deep cervical space

where it has been entered. Silk sutures are used to close the skin. The gauze drain has its exit at a dependent position. A modified Barton bandage is used to compress tightly a fairly heavy gauze dressing. The gauze drains are removed after forty-eight hours, and a dressing is applied to compress the skin flap into the submaxillary space.

In elderly persons local anesthesia is advantageous over a general anesthesia. There is less bleeding. The exposure is easier, and the patient has a happier postoperative course.

*Unilateral Removal of the Lymphatic Areas en Bloc.*—The operation of unilateral removal of the glands of the neck en bloc is indicated in unilateral lesions of the oral cavity and pharynx and hypopharynx under the conditions outlined previously and often in known submaxillary metastasis following carcinoma of the lip.

Crile first emphasized the advantages of complete resection of the neck en bloc. His operation included the removal of the sternomastoid muscle and the deep jugular vein. Kocker, Butlin, and Maitland advocated a less radical operation without removal of the jugular vein unless the glands were adherent to it. When the operation is indicated, we ordinarily perform the complete operation. It is essentially as follows:

An incision is made from a point about the level of the sternomastoid process which curves downward to about the level or a little below the greater cornu of the hyoid bone. The knife is then continued upward to a point a little past and below the midline submental region. From the midpoint of the incision a second incision is made downward to a point about three-fourths inch above the clavicle and to the outside of the sternomastoid muscle at this point. From this point, about three-quarters of an inch above the clavicle the incision is turned backward and extended about two inches parallel with the clavicle. The upper skin flap (Fig. 4) is dissected upward to a point about one-half inch above the lower edge of the mandible. The posterior flap is dissected back until the posterior neck muscles are exposed. The anterior flap is dissected forward to within about three-fourths inch of the midline. Along the lower edge of the mandible the platysma and other subcutaneous tissues are crosscut down to the periosteum of the mandible and the masseter muscle. The facial artery and vein are caught and ligated at the anterior border of the masseter. This allows one to free the attachment of the tissue along the lower edge of the mandible. A second incision is made immediately beneath the original skin incision over and along the digastric muscle. The facial vein is caught and ligated above the digastric mid-tendon. The submaxillary gland is pulled upward and the facial artery caught and ligated as it passes into the posterior surface of the gland. The submaxillary triangular tissues are freed from the anterior border of the sternomastoid where is encountered a sort of facial raphe. The submaxillary gland and the contents of the triangle are turned upward over the edge of the mandible. The contents of the submental triangle are then dissected off the mylohyoid muscle. The projection of the submaxillary gland above the mylohyoid muscle is pulled downward from above the mylohyoid, ligated and cut.

One then drops to the lower part of the neck and with forceps picks up the lower end of the sternomastoid muscle and crosscuts it. With dissecting scissors the deeper jugular vein is exposed. It is freed, doubly ligated and cut. The fat of the triangle posterior to the sternomastoid and above the clavicle is dissected out and upward, the carotid artery is then exposed. The deep jugular vein, the sternomastoid muscle and all the surrounding tissues are freed from the carotid artery in an upward direction. The omohyoid muscle is cut. The thyroid artery often is ligated. The occipital artery is ligated as the dissection comes to it.

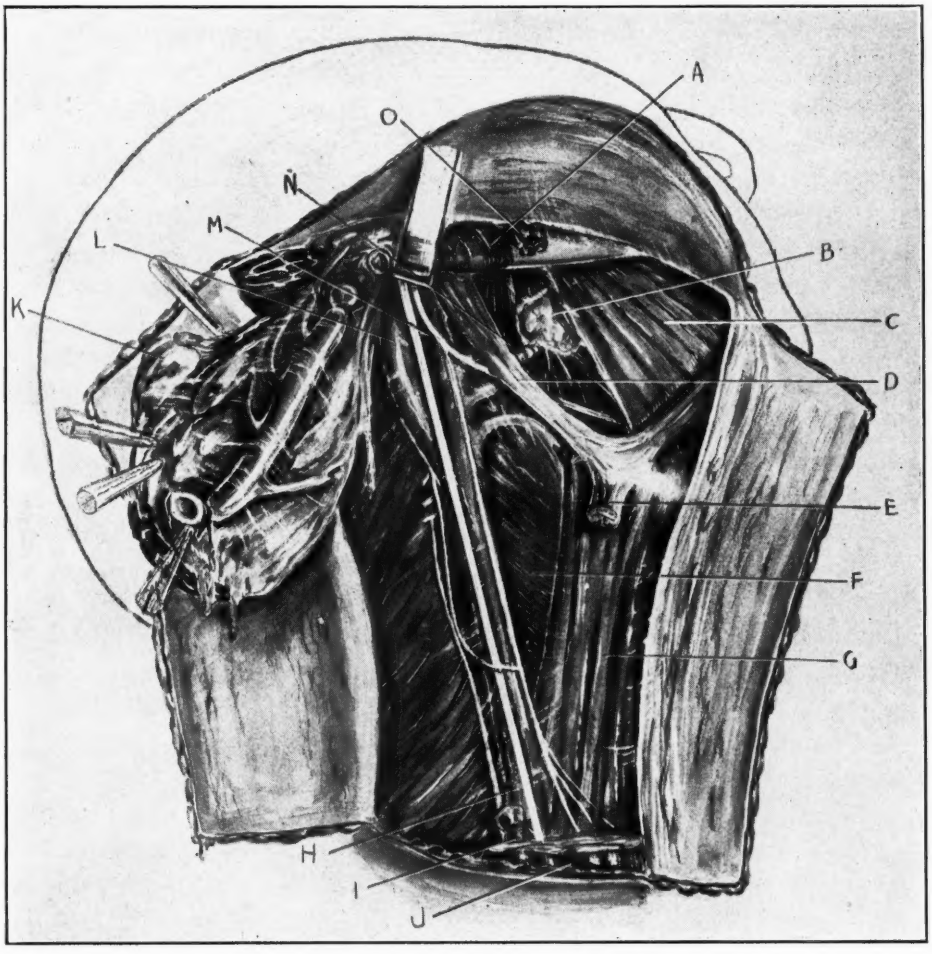


Fig. 4.—Diagram of complete unilateral bloc dissection of the neck. The areolar tissue of the submaxillary triangle and the areolar tissue along the parotid from above the clavicle to the mastoid process is removed. To remove these thoroughly it is considered necessary to remove the sternomastoid muscle and the deep jugular vein. *A*, Masseter muscle; *B*, stump of submaxillary gland; *C*, mylohyoid muscle; *D*, posterior belly of diagastric muscle; *E*, stump of omohyoid muscle; *F*, constrictor muscle of pharynx; *G*, pretracheal muscle; *H*, common carotid artery; *I*, stump of ligated deep jugular vein; *J*, crosscut stump of sternomastoid muscle; *K*, lymph node in the tissue being excised en bloc; *L*, internal carotid artery; *M*, external carotid artery; *N*, ligated stump of facial artery; *O*, stump of facial artery and facial vein as they cross the mandible.

Usually the lingual is not ligated. The facial artery has already been exposed and ligated. The tissues of the lateral neck have now been freed up to the lower parotid pole. The carotid arteries lie in plain sight along with the vagus and sympathetic nerve. All branches of the carotid artery are ligated at least one-

half inch from the main artery. The hyoglossal nerve is not molested. The spina accessory nerve is cut as it enters the sternomastoid muscle. The superficial nerves are also cut.

Next, the sternomastoid muscle is crosscut just below the mastoid process attachment. One comes down upon the upper end of the deep jugular vein above the digastric muscle. The upper end of the vein is isolated, doubly clamped and doubly ligated. Usually the lower pole of the parotid gland is crosscut. In it lie several veins and small arteries which have to be clamped and ligated. Now the sternomastoid muscle along with the deep jugular vein, the neck areolar tissues and lymphatic structures are entirely freed and removed.

The skin flaps are replaced to their former positions and sutured. A small pack is placed to the lower pole of the parotid, submaxillary fossa, and another just above the clavicle at the lower edge of the dissection. A large pressure dressing is placed on the neck with bandage running up over the head. The operation is usually done under local anesthesia.

A combination of block anesthesia and infiltration anesthesia is best. The superficial cervical nerves are blocked. The inferior dental nerve is blocked by passing a needle upward inside beneath the angle of the jaw. The remainder of the anesthesia is of the infiltrative type—both deep and superficial. With local anesthesia, tissue planes are easy to see, little blood is lost, and the patient should not be affected greatly by the operation.

The operation takes about thirty-five minutes to complete if one is adept at doing it. The pulse should not be over 85 or 90 at its completion. Immediately after the operation the patient is given a cup of warm coffee and is placed in a semi-reclining position in bed. The packs are removed after three or four days. The pressure dressing is continued in such a fashion that all dead spaces are collapsed. The stitches are removed in one week to ten days.

The diathermic knife or the cautery knife may be used for doing this operation if one prefers. In our opinion the dissection along the artery, however, had best be done with dissecting scissors or a scalpel. Otherwise one runs too great a risk of damaging the artery.

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# ORAL MANIFESTATIONS OF PELLAGRA*

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PELLAGRA is a constitutional disease found in many tropical countries, chiefly southern Europe, Egypt, India, Central America, and the West Indies. In the United States according to authorities the disease occurs most frequently in the states south of the Potomac and Ohio rivers.[1]

Pellagra is a disease that does not respect age, race, or sex and is characterized by a disturbance of the skin, the alimentary canal, and the central nervous system.

In view of the fact that pellagra is essentially a tropical disease, and inasmuch as its incidence is chiefly confined to the southern states, this discussion may not contain a great deal of practical interest for those who live in sections of the country where it is almost unknown. Nevertheless, pellagra is a very interesting study as a disease; and due to the fact that its etiology is commonly considered to be of dietary origin, and since it manifests its first symptoms in the mouth, it is important that dentists practicing in the southern states give due consideration to its diagnostic symptoms.

The oral manifestations in pellagra are but one of its many symptoms, and, in view of the fact that it is a constitutional disease, the oral lesions disappearing when the patient is given pellagra preventive treatment, it is reasonable to assume that its treatment does not come within the sphere of dentistry. However, the one who sees the patient first must assume the responsibility of prompt action. The oral lesion being the first notable manifestation of pellagra, the dentist is often the first one consulted, and he should always have in mind the importance of securing prompt medical attention for the patient.

## HISTORY

The name pellagra is derived from the Latin word (pella) skin, (agra) rough, meaning, rough skin and so named because of the characteristic skin lesion. The first authentic appearance of the disease was in southern Spain in 1735. In 1771 the disease assumed the proportions of an epidemic in southern Europe, and at that time it was given the name of pellagra by an Italian named Frapolli. The earliest cases in the United States were in the year 1835, reported by Dr. John P. Gray, Utica, N. Y., and Dr. Tyler of Somerville, Mass. In 1889 Dr. Bemis of New Orleans reported some cases. An appreciation of the extent and prevelance of pellagra was not felt in this country until the beginning of the present century.[2] It was about this time that Dr. Searcy of Alabama described and found pellagra epidemic in the South. Dr. B. F. Harris of Georgia reported cases about the same time. By 1908 the disease had reached

*Read before The American Association for the Advancement of Oral Diagnosis, May, 1936.

alarming proportions, and from 1908 to 1918 it was more or less epidemic in the southern states. In 1917 there were reported 170,000 cases in the United States.

Between 1917 and 1933 there seems to have been a diminishing incidence of the disease, as in 1933 reports from statisticians indicated but 72,760 cases. Over a ten-year period, from 1924 through 1933, the total deaths reported in twenty states was 53,669.[3]

Pellagra is described as one of the rare diseases of the South. It is found most frequently in the rural sections among the families of farmers (usually share croppers), factory workers, inmates of almshouses, and insane asylums Its incidence is confined almost entirely to negroes and the poorer classes of white people.

There has been much controversy and difference of opinion concerning the causes of pellagra.[4] Italian investigators expressed the belief that it was caused by the excessive use of maize as a food, or perhaps from eating moldy maize. Two other theories have been advanced to account for its etiology: one that it is caused by an infectious organism; and the other that it is in some way related to a faulty diet lacking in vitamins B and G. The late Joseph Goldberger of the U. S. Public Health Service was an advocate of the faulty diet theory and did some outstanding research to prove his theory. He found that those fed on low protein and high carbohydrate with little fruit and vegetables developed the disease.

Goldberger and Wheeler fed dogs on a diet high in carbohydrates and low in proteins with no fresh vegetables, milk or butter and produced a disease known to veterinarians as black tongue, and similar to pellagra. The dogs were cured by feeding them food rich in vitamin G, which they called P.P., or pellagra preventive factor. This vitamin G is said to be found in fresh milk, butter, fresh meats, vegetables, and brewers' yeast. I may state here that South Carolina began distributing yeast as a preventive remedy in 1928 and since that time has distributed thirty tons annually.

After a most scientific investigation, the Thompson-McFadden Commission came to the conclusion that "no specific cause of pellagra has been recognized, but in all probability it was a specific infectious disease communicable from one person to another by means at present unknown." A number of American authorities as well as English investigators have arrived at the same conclusions. There is evidence that a hot climate, a dietary deficiency, and an infectious organism all play a part in the syndrome called pellagra.

Goldberger, Wheeler, Tillie and Rogers have reported that black tongue of dogs is most probably the analogue of pellagra in man, and that the pellagra preventive factor and the black tongue preventive treatment are identical. It is interesting to note that the same dogs were used repeatedly in carrying on this experimental work in the U. S. Public Health Laboratories.

## SYMPTOMS

In the early and active stages of pellagra the skin lesions come early and look like a sunburn.[6] As the disease progresses and becomes more or less chronic, the skin becomes roughened and scaly. The back of the hands is a

common site for this lesion, though often it extends to the elbow. The face and neck may also have these rough and scaly areas. A symptom often noticed is a dermatitis ring around the anus, which has a scalded appearance. Diarrhea is an early and frequent symptom. Later it may alternate with constipation.

The first notable symptoms in pellagra are in the alimentary canal; then the cutaneous surfaces; nervous and mental manifestations usually coming later. In the alimentary canal the parts chiefly affected are the mouth and the colon.

Pellagra is a disease which is very irregular in its manifestations, requiring many months for its full development. Seasonal variations and cold weather remissions are suggestive. Both the gastrointestinal and the nervous disturbances or any of the major symptoms may be absent in the developmental stages. When the disease has an endemic character, diarrhea as well as digestive disturbances and sore mouth are important symptoms. Few pellagrins fail to give a history of a gingivostomatitis, lasting one or two weeks and occurring in the spring or summer months. The inflamed tip, tender margins, and prominent papillae of the pellagrous tongue, which are more or less persistent symptoms between attacks, must be differentiated from those sometimes seen in uremia, acute alcoholism, sprue, etc. A study of the stool will help to differentiate it from sprue.

A patient suffering with pellagra may first seek medical aid because of a sore mouth or sore tongue. He may give a history of a stomatitis occurring in the spring or summer, lasting a week or two, and recurring perhaps the following year; the lips are dry and may be cracked; the complaint is made that they burn, and the whole mouth feels as if it were scalded. The gums are usually tender. Eating and drinking are painful. The whole mucous membrane appears unduly red, and even before the appearance of the skin erythema there are signs in the mouth which indicate an attack. Aphthae which are more persistent than ordinary aphthae, may appear on the gums and on the inside of the cheek. They do not respond well to treatment with silver nitrate or other caustics. The sore mouth does not usually last over two or possibly three weeks, and between the attacks there is nothing characteristic about the gums. The tongue, however, affords much information during the outbreak, as well as during the less active periods of the disease. Frazer calls attention to several diagnostic points as regards the tongue.[7]

Before an outbreak of pellagra, and sometimes during the intermissions of the disease, the tongue may present the appearance of a normally coated tongue, but often a more careful examination will reveal the presence of papillae on the tip and anterior portion of the tongue, showing through the coat, which has been called the "stippled" tongue. An enlarged tongue is not uncommon. The characteristic feature of the pellagrous tongue, however, is the shedding of the epithelium, so that the organ looks smoother, cleaner and very red.

In the beginning the shedding of the lingual epithelium is seen at the tip and sides of the tongue. A more marked denudation may leave only a small coated strip or two narrow symmetrical areas on each side of the long axis of the tongue. When the tongue is completely stripped, there is the appearance variously described as the bald, beet, beefy, raw, and cardinal tongue. The

shedding of the epithelium is most marked during the outbreak, as between the attacks it tends to be replaced. The tendency to regeneration is seen most often on the central part of the dorsum, as the tip and margins of the tongue often remain denuded or with but a scanty epithelial covering.

While the tongue of pellagra is usually very red, resembling the meat of watermelon, occasionally a smooth and slimy looking tongue is seen which is undoubtedly pellagrous, and which is quite pale. Pellagrous tongues may even present a cyanotic hue. As the tongue is extended, tremor may often be seen, and in some cases the movements are so irregular that tremor does not describe them. More often one sees a swollen, thick, and fissured tongue, while ulcers at the margins occur in a considerable number during the outbreak, and a sharply pointed tongue may be occasionally seen.

The fissured tongue is a great aid in the diagnosis of pellagra. Every tongue with fissures is not a pellagrous tongue, but one should always be on the lookout for the fissured tongue; and the association of fissure with enlargement, tremulousness, and partial or complete epithelial denudation of the tongue is sufficient to justify one in suspecting pellagra as the most probable cause of the condition.

During an attack of pellagra fissures may be noticed along the medial fold and limited to the anterior portion of the tongue or radiating from this fold in all directions. These fissures may be longitudinal, extending a considerable part of the length of the tongue, or they may be transverse, crossing the central fold and at right angles to the long axis of the tongue. They may be superficial, few in number, and limited to the extent that they corrugate the surface of the tongue so that it resembles the skin of the scrotum when cold.

### TREATMENT

The treatment in pellagra that promises most is dietary, with high protein and low carbohydrate intake, and food that is rich in vitamins A, B, and G. These foods are milk, eggs, raw meat, vegetables and fruits; brewers' yeast, rich in vitamin B, may be added to this diet. Bismuth and paregoric are recommended for the diarrhea. Good results in controlling diarrhea have been obtained by giving lactose in buttermilk three times daily. Arsenic in some form has been largely used, but has not always proved satisfactory.

Recently English and Egyptian physicians have claimed sodium thiosulphate to be a curative agent. It is stated by Dr. Spires of Cleveland that oral lesions of pellagra yield rapidly to large doses of desiccated pig's stomach and to massive doses of liver extract.

The lack of vitamin C, the antiscorbutic vitamin, produces many changes in the mouth. Its absence from the diet produces scurvy, hemorrhage, injuries to the dental pulp, swelling and puffiness to the gingivae. Some say that the physician and the dentist never see a real case of scurvy now. That may be true, but they see many cases that may be diagnosed as mild chronic scurvy. In fact, some authorities believe that many cases of pyorrhea are really mild types of scurvy.

The prevention of pellagra is a most important consideration, and I shall close by quoting from an article by Wheeler and Sebrell.[8] "The home sur-

rounded by evidence of a good garden, a cow or two, a few pigs and some poultry may as well be passed up, for the chances are less than one in a thousand that pellagra will be found. On the other hand, the home surrounded by last year's cotton patch will bear watching.''

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# OSTEODYSPLASIA WITH MULTIPLE MESENCHYMAL TUMORS: FIBROMA, EXOSTOSES, AND OSTEOMAS*

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DISEASES which simultaneously affect various parts of the body are of great interest. They generally involve organs or tissue derived from a particular germ layer. Mesenchymal derivatives especially are subject to generalized involvement. The embryonic mesenchyma gives rise to the following structures: connective tissue, adipose tissue, cartilage, bone, cementum, and dentin. In achondroplasia (chondrodystrophia foetalis) the cartilaginous bone formation is affected; in osteogenesis imperfecta the bone of the entire skeleton is defective due to aplasia and dysfunction of the osteoblasts. In both these diseases dysplasia is associated with hypoplasia, but in other cases the affected tissue becomes overproductive. Hereditary deforming chondrodysplasia with multiple exostoses is an example, and also the case to be presented, in which several bones and mesenchymal tissue in general were similarly affected without, however, involving cartilaginous formation. No other case of this type has been discovered in the literature.

## CASE REPORT

The patient, A. D'A., aged eighteen years, was referred to me at the tumor clinic of the Beth Israel Hospital by Dr. Charles Smith and the Rhode Island Hospital on suggestion by Dr. J. Aub. The patient's chief complaint was the presence of hard lumps on both sides of the jaw, on the right side of the face and the right mastoid region. He had had these since childhood, with quite apparent increase in size during the past five years. He complained of pressure against his ear when moving the jaw, and disfigurement.

*Family History.*—Father, three sisters, and three brothers are living and well. Mother died of some liver condition. There is no familial history of any disease.

*Past History.*—He was born in Bristol, R. I., of Italian parentage, lived in Italy for two years when two to five years old, and then in Bristol ever since. Recalled no past illness.

*Present Illness.*—Patient always had noticed swellings on the jaw. Five years ago (1932) he had a swelling anterior to his right ear removed at the St. Joseph's Hospital in Providence with the diagnosis of "rhabdomyoma." At that time he had noticed very small nodules as follows: on the left and right border of the mandible, on the ramus anterior to the right ear, and one over the right mastoid region. These were now all much larger and tender to touch,

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having continually increased in size at a gradual rate. Eighteen months ago (June, 1934) he noticed another hard walnut-sized, nodular swelling on his right chest in the region of the right anterior axillary fold. This was completely excised at the Rhode Island Hospital with the diagnosis of "fibroma of the pectoral muscle sheath." Two months ago two mandibular teeth and bone from the left mandible were removed; the specimen was sent to me.

*Present Examination.*—General physical examination was entirely negative. Patient was a well-developed, strong young adult, in good health and normal in every way except for the deformity of the face. The left mandible showed on the lower border, 0.5 cm. from the angle of the jaw, a hard bony mass, irregular in shape, 2.5 cm. × 2.5 cm. (Fig. 1). On the right side of the mandible 2.5 cm. from the midline was another hard bony mass 1.5 cm. × 1 cm. (Fig. 2). In the

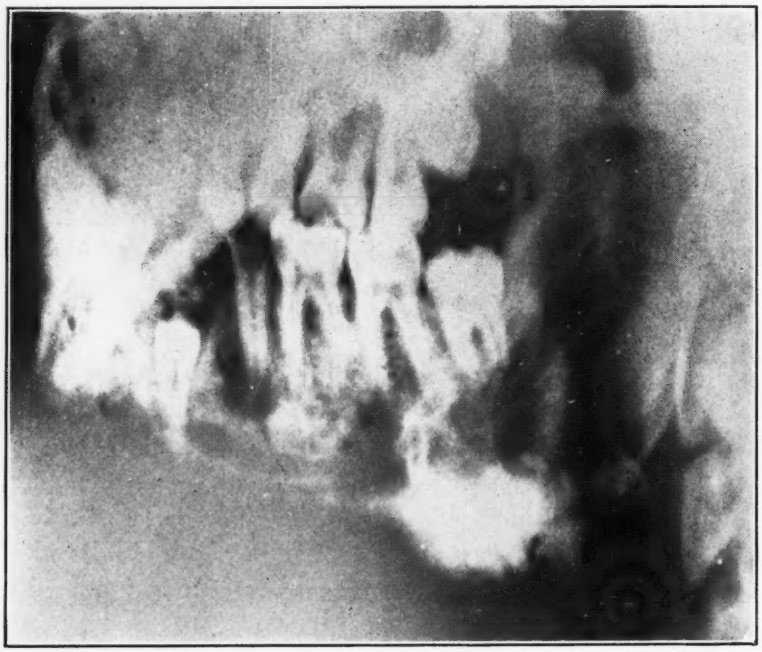


Fig. 1.—Left mandible, osteodysplasia and osteomas on inferior border and angle of jaw.

right parotid region was a hard, irregular mass 5 cm. × 2 cm. extending from the angle of the mandible to the zygomatic arch (Fig. 3). In the right mastoid region there was a hard bony mass the size of a golf ball measuring 7.5 cm. × 5 cm. There was no limitation of motion of the jaw, but on opening pressure was exerted against the external auditory canal, moving the ear and causing discomfort. These masses did not encroach upon the oral cavity. Over the right parotid region was a well-healed scar where the tumor was excised as describe above. The right chest on the anterior margin of the right pectoralis major muscle showed a well-healed wound with a puckered scar.

*Laboratory Examination.*—Urine was negative. Blood sugar 80; nonprotein nitrogen 33; blood calcium 10.6; serum phosphate 3.40; phosphatase 2.59. Raised phosphatase consistent with bone growth; otherwise metabolism was nor-

mal. Kahn and Wassermann tests negative. On admission, Jan. 27, 1936, the blood count was: red blood cells 4,900,000; hemoglobin 90; white blood cells

Fig. 2.—Right mandible with osteomas on inferior border.

Fig. 3.—Skull showing osteoma attached to the ramus and one in the maxillary sinus.

7,300. Wassermann and Hinton negative. A thorough endocrinologic study made by Dr. Blumgart was also negative.

*X-ray Examination.*—(Jan. 28, 1936.) The mandible revealed multiple bony tumors in the regions described above. The body of the mandible showed osteoplastic and some osteolytic changes (Figs. 1 and 2). The first premolar on the left was not completely erupted. The second premolar was carious and showed evidence of pulp and periapical infection (Fig. 1). The anterior-most tumor on the inferior border of the right mandible showed rarefaction suggesting cartilage. The second molar was carious and showed evidence of periapical infection (Fig. 2). There was a large rounded mass of bone tissue in, and coming off the posterior wall of the right maxillary sinus which seemed to be displacing the posterior wall of the antrum forward (Figs. 3 and 4). The skull revealed no definite evidence of abnormal changes except some increased density in the region of the right mastoid process, which was probably due to an osteoma in this location. The long bones showed small sessile osteomas of the humeri,

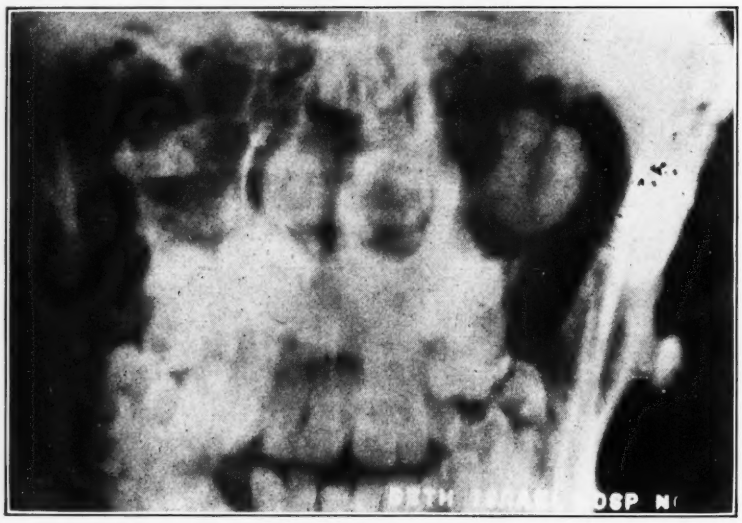


Fig. 4.—Anteroposterior view showing osteoma in the maxillary sinus and small osteoma attached to the side of the ramus.

radii, and ulnae (Figs. 5 and 6). The radii, especially on the right, seemed to be foreshortened and slightly wider. The carpal bones showed small circumscribed areas of rarefaction, especially in the os magnum and semilunar bones, suggesting an osteoid type of osteoma. There were also some small osteomas on the femora and fibulae. Roentgen impression of the above findings would indicate chondrodysplasia with multiple osteomas.

*First Operation.*—Excision of the osteoma on the right ramus of mandible with intrapharyngeal ether anesthesia. Horizontal incision was made over the zygomatic arch about 5 cm. long. Exposure of the masseter muscle and detachment of its posterior one-half from the zygoma. Exposure of the ramus of the mandible and extension of the incision from the posterior end in a vertical direction anterior to the external ear, approximately as far as the tragus (Fig. 7). During the dissection the tumor was seen to be attached to the outer surface of the ramus 2 cm. below the neck of the condyle; the temporal branch of the

facial nerve was cut, and a branch of the transverse facial artery was ligated and divided. The tumor was found to have a broad pedicle, 4 cm. in length, and to be so extremely hard that the use of chisels was without effect; four drill holes were therefore made extending about one-third of the way into its base. The tumor then was detached with great effort and after being dissected from the tissue attachment at its lower end was removed, though it caused considerable stretching of the skin. The wound was closed by sutures.

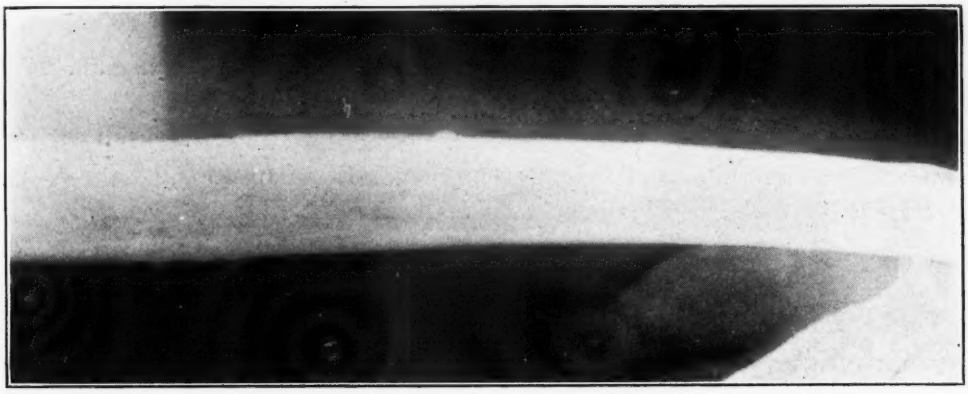


Fig. 5.—Humerus showing exostoses.

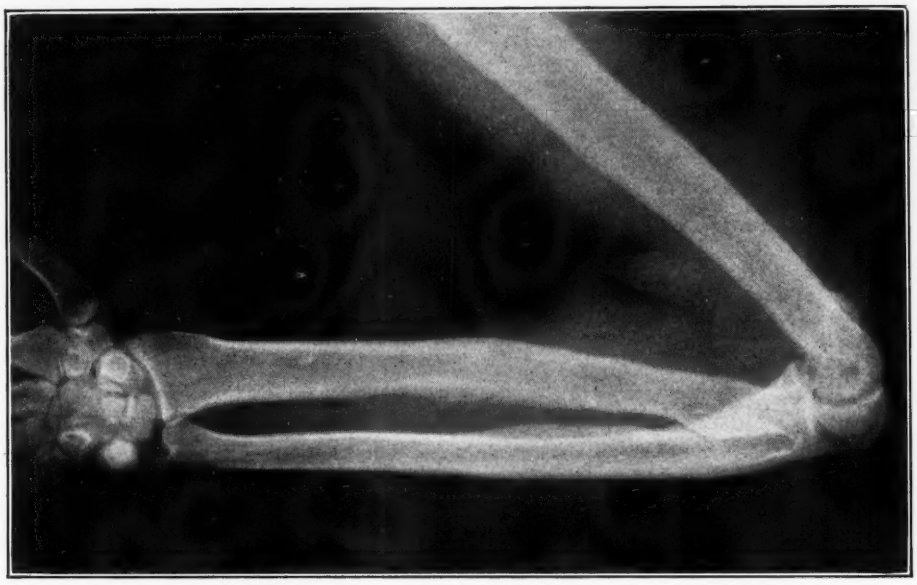


Fig. 6.—Arm showing exostosis of humerus, especially near the elbow joint.

*Clinical Course.*—Postoperatively the patient developed marked swelling of the right side of the face, associated with a good deal of pain, but there was no limitation of motion of the jaw. On the fourth postoperative day it was noticed that the patient had a slight right facial paralysis with the exception of the fibers innervating the orbicularis oris muscle. On the fifth postoperative day the pain diminished, and the edema over the right parotid region disappeared. Examination prior to discharge revealed the wound to be well healed. Accord-

ingly the patient was discharged on the sixth postoperative day to return at a later date for removal of the other exostoses.

*Second Admission.*—One month later (March 6, 1936) the patient was readmitted. The swelling of the side of the face previously operated had disappeared completely. The facial paralysis had subsided except in the temporal region and the eyebrow. The patient desired to have the tumors on both sides of the lower border of the mandible removed (Figs. 1 and 2), and a small tumor on the outer surface of the ramus, on the right (Fig. 4), which, since the large osteoma had been removed, presented a distinct individual swelling.

*Laboratory Tests.*—Blood chemistry was repeated. Serum calcium 9:74; serum phosphate 3.31.

*Roentgen examination* showed the large tumor previously on the posterior border of the right ramus completely removed. A small pedunculated osteoma, however, still remained (Fig. 4). Other findings as in previous examination.

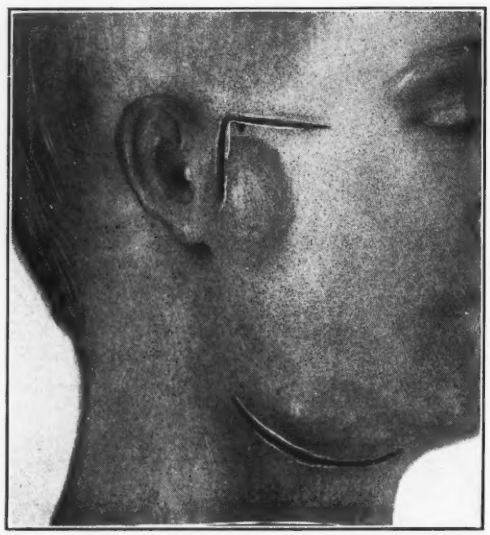


Fig. 7.—Incision for the first and second operations.

*Second Operation.*—With intrapharyngeal ether anesthesia a curved incision was made on the left side, about 1 cm. below the border of the mandible extending from behind the angle of the jaw for about 8 cm. The external maxillary artery and vein were dissected, ligated, and cut. The fascia over the tumor was divided and the hard eburnated tumor exposed. Two additional smaller tumors were found posterior to the large one, so that the incision had to be extended in that direction. The tissue was separated from the tumors until the mandible was visible. The periosteum was incised about 0.5 cm. from the base of the tumor and pushed back with a blunt dissector. Drill holes were made into the cortex of the bone at the base of the tumors, which were detached with a chisel. The bone was then smoothed with a bone rasp. As there was considerable oozing from the opened spongiosa, a rubber drain was inserted and attached to the skin with a suture. The fascia was closed with catgut, and the skin with clips.

The right side was next prepared for operation. A similar incision as described above was used to expose the tumor (Fig. 7). The external maxillary artery and vein were found displaced by the tumor in a posterior direction and were tied and cut, as on the other side. The tumor mass was then exposed (Fig. 8) and removed as described for the operation on the left side. The masseter muscle was then incised in a vertical direction, and after exploring the external surface of the ramus, the small pedunculated tumor shown in Fig. 4 was located and detached from its base with a chisel blow. A rubber drain was inserted and the wound closed as above.

*Clinical Course.*—The patient had considerable swelling of the neck, but his temperature remained normal. The white count mounted to 12,000 on the second day but dropped to 8,400 on the sixth. The drain was removed on the second day, the clips on the third, and the patient discharged on the seventh. The

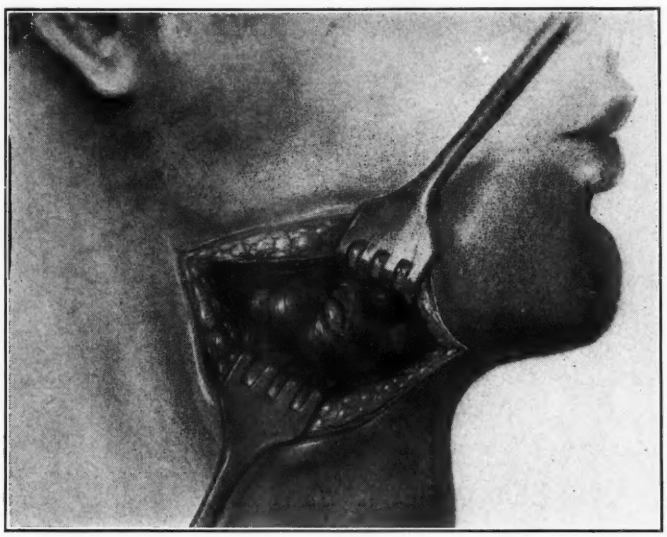


Fig. 8.—Operation to remove the osteoma attached to the inferior border of the mandible on the left side.

patient was seen for reexamination two months later; his recovery had been uneventful and his appearance was much improved.

*Pathologic Examination.*—Pathologic specimens available for study consisted of:

(1) Two teeth, one the carious premolar seen in Fig. 1; and bone from the mandible proper.

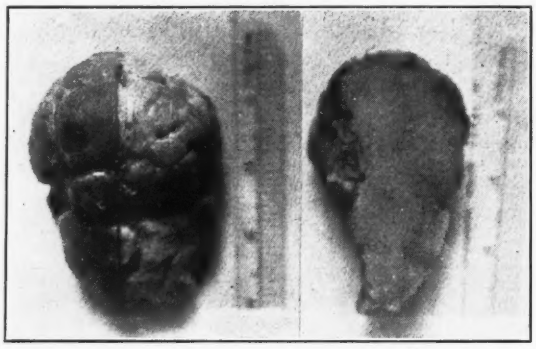
(2) Osteoma excised from the right ramus (first operation).

(3) Osteomas excised from the right and left inferior border of the mandible (second operation).

*Microscopic Examination of Bone From Mandible.*—Some of the bone was normal, but there were places which showed marked dysplasia. There appeared to be a conversion of the normal spongiosa into an osseous structure of abnormal make-up and arrangement (Fig. 11). The new bone was of a coarse woven

variety with irregularly arranged cells and many curvilinear markings. The marrow was represented by fibrous tissue similar to that found in localized osteitis fibrosa. There was no evidence of cartilage in the material examined.

*Gross Examination of the Osteomas.*—The osteomas excised at the Beth Israel Hospital, Boston, consisted of a large lobulated bony tumor with ivory hard surface, from the right ramus (Fig. 9) measuring 3.5 cm. × 2 cm. × 1.5



*A.* *B.*

Fig. 9.—*A*, Osteoma excised from the external surface of the ramus (first operation); *B*, appearance of the cut surface.

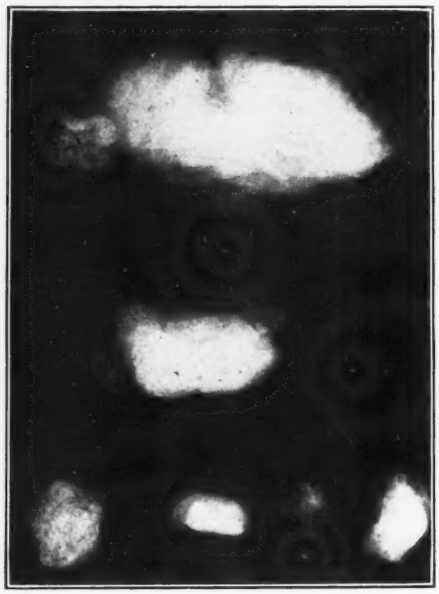


Fig. 10.—X-ray of the osteomas excised from the left and right mandible (second operation).

cm., a hard lobulated bony tumor from the left inferior border of the mandible measuring 4.5 cm. × 2.5 cm. × 2 cm., and four smaller bony tumors from the right side of the mandible; these were from 1 to 2 cm. in diameter. X-ray appearance of these tumors is shown in Fig. 10.

*Microscopic Examination of Osteomas.*—Examination of three tumors showed them to be composed of bone made up of a thick outer cortical layer surrounded by a thin connective tissue membrane which extended into the nutrient

canals and occasionally formed septae dividing the tumor into lobes (Fig. 12). The central part showed dense bone containing fibrous cellular marrow with active osteoblasts indicating a gradual decrease in the size of the marrow spaces (Fig. 13). In some parts of the larger tumors there were areas in which the tissue appeared to be disintegrating (Fig. 12, right side). The trabeculae here were fragmented, of irregular architecture, and surrounded by acellular necrotic tissue. This condition might have been due to a trophic disturbance from interference with the blood supply by the active bone formation. These areas being less radiopaque than normal bone, probably give the tumor the

Fig. 11.—Bone from the mandible. Left side shows normal cortical bone. Right shows dysplasia of the spongiosa.

mottled appearance in the x-ray picture described by the roentgenologist as "areas of rarefaction suggesting cartilage." No evidence of cartilage was found in any of the tumors. The tumors therefore can be classified as hard osteomas (osteoma dura).

*Microscopic Examination of the Teeth.*—The premolar showed that the pulp had been infected; at the external surface of the root there was evidence of repair caused by filling in with bone an area of resorption (Fig. 14). The other tooth at the apical part showed resorption of cementum and dentin, extending into the pulp canal. The resorbed tissue was replaced by compact

lamellar bone containing in some places fibrous marrow similar to that seen in the tumors (Fig. 15). This dental dysplasia was probably part of the same pathologic process seen in the bone.

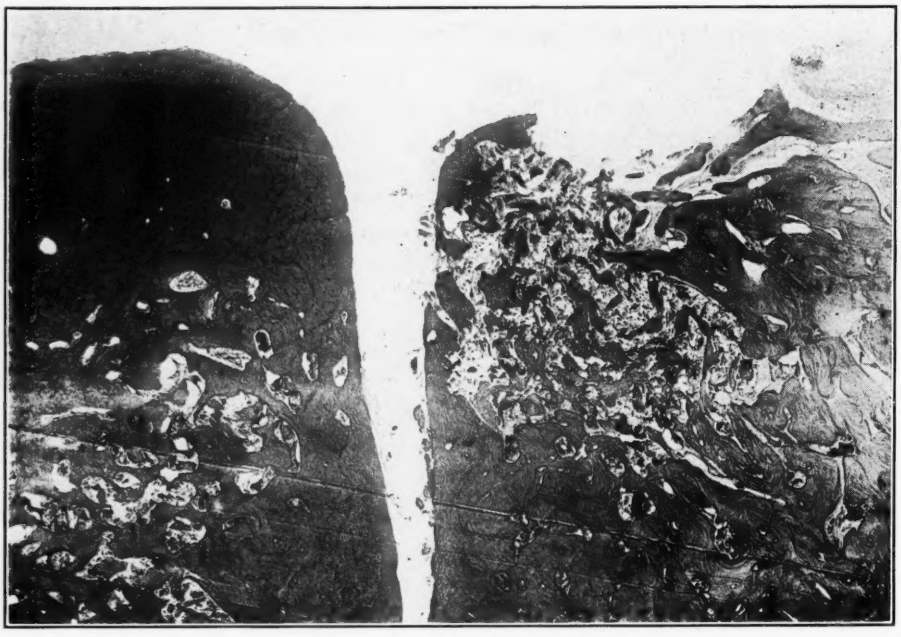


Fig. 12.—Large osteoma removed from the ramus showing the bone each side of a septum dividing the tumor into lobes. Note marked dysplasia on right side of cleft.

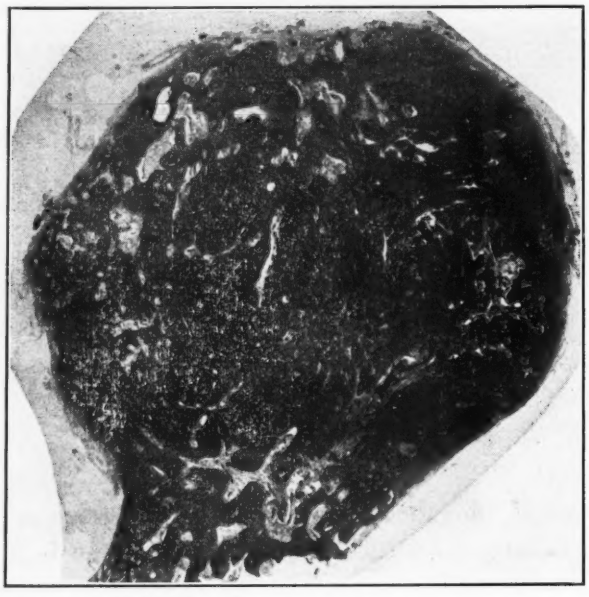


Fig. 13.—Complete section of small osteoma removed from the inferior border of the mandible on right.

## CONCLUSION AND DIAGNOSIS

This disease was probably caused by a general disturbance of the mesenchymal structure. A fibroma formed from the sheath of the pectoral muscle, a

rhabdomyoma is said to have been excised from the cheek, and the entire skeleton, as well as the teeth, was affected. The involvement of the skeleton, however, was the outstanding feature.

Fig. 14.—External surface of premolar showing the area of resorption repaired by lamellar bone.

Fig. 15.—Resorbed root, repaired by dense lamellar bone.

There are several diseases affecting the entire osteogenic system. Hereditary deforming chondrodysplasia described by Ehrenfried (1917) answers to some extent the description of this case. About 600 cases of hereditary deforming

chondrodysplasia have been reported, of which two or three affected the skull. It is generally transmitted through both parents, and, while it is often associated with shortening of the stature and crookedness of the legs and arms, there are none of the other congenital anomalies of chondrodystrophia foetalis found, such as waddling gait, synostosis of the base of the skull causing a retracted maxilla, tilted palate, and stub-nosed face. The outstanding symptomatology relates to the more or less symmetrically occurring osteochondromas which disfigure and produce symptoms when pressing against important structures. The cause of the disease is not known, but Geschickter believes it to be a disturbance of the embryonic perichondrium. He contends that in its earliest state the bulk of the periosteum is in reality perichondrium, tissue identical with precartilaginous connective tissue about joints. An arrest of development would allow at many points such cartilaginous tissue to persist, which give rise to the pediculated osteochondromas later. These grow during youth, and new ones may arise until adulthood, when their development generally stops. A few cases have been reported with secondary malignant changes. Creyssel and Peycelon (1930) reported a patient developing chondromyxosarcoma.

The case presented resembles clinically hereditary chondrodysplasia on account of the multiple involvement of the skeleton by exostoses and bony tumors, and dysplasia affecting the structure of the bone, though there is no history of inheritance. Pathologic investigation, however, shows no cartilaginous formation, either in the tumors produced or in the bone itself. The skeletal disturbance affects therefore principally the periosteum and endosteum, giving rise to exostoses and bony tumors. Associated with these phenomena is a dysplasia seen in the spongiosa of the bones as well as the large osteoma. The case therefore should be diagnosed as osteodysplasia with multiple mesenchymal tumors, particularly exostoses and osteomas.

47 Bay State Road

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# ORAL MANIFESTATIONS IN LEPROSY*

## General Survey of Oral Conditions as Determined in the National Leprosarium

Bernard M. Prejean,† D.D.S., Carville, La.

In January, 1921, the Louisiana Leper Home was purchased by the federal government and administered as the National Leprosarium by the U. S. Public Health Service, at which time there were one hundred and forty patients hospitalized. Prior to the year 1921 the Louisiana Leper Home rarely accepted patients from other states. Subsequently the facilities of the institution became available for use by the entire United States. The increase of patients to approximately four hundred from different parts of the United States is not indicative of an increase in leprosy; it is mainly due to the utilization of centralized facilities.

The progress of science has done away with the unwarranted fear most people have of infectious and slightly contagious diseases; and, although we do not know everything about leprosy, science outlines certain precautionary measures which insure the safety of those who care for the lepers. This progress has called for the entrance of scientific dentistry in the Leprosarium to fight off the dental, oral and extraoral complications present in a majority of cases by treatment and operative procedure, simultaneously giving due credit to Dr. Spencer B. McNair, consulting specialist of the U. S. Marine Hospital, for having instituted certain operative procedures for the relief of oral and extraoral ills.

### THE BACILLUS HANSEN

*Mycobacterium leprae,* a bacterium discovered by G. Armauer Hansen, the causative organism of leprosy, resembles the bacillus of tuberculosis, in both morphologic and staining characteristics, so that microscopic differentiation of the two diseases requires some experience. Inoculation of animals in the laboratory offers an additional means of differentiation, since guinea pigs and certain other animals which are highly susceptible to the bacillus of tuberculosis are highly resistant to the Hansen bacillus of leprosy; furthermore, the bacillus of tuberculosis is cultivated artificially with comparative ease, while the cultivation of bacillus Hansen, if it has been cultivated, is with the greatest technical difficulties.

Clinically the disease is recognized in two main types: the skin, tubercular or nodular; and the nerve, anesthetic or macular type; a combination of the skin and nerve types is termed, obviously, the mixed type.

The nerve, anesthetic or macular type is characterized by results of degeneration of peripheral nerves tending to produce paralysis of the muscles of the

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Read before the American Association for the Advancement of Oral Diagnosis, May, 1936.

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face and mouth and loss of sensation of the lips, the mucous membrane of the mouth and cheeks indicating an affection of the fifth and seventh cranial nerves. Motor functions consisting of paralysis with atrophy have been observed in a reasonable percentage of patients examined in the National Leprosarium.

Facial nerve paralysis in leprosy has usually been of bilateral distribution. It differs from the ordinary type of affection, first because of its bilateral distribution and second because of the particular way the individual muscles are affected; very frequently a part of a muscle only may be affected; a few filaments of muscle only may be completely paralyzed while the remainder of the muscle may be either partially or not at all affected. This affection of the distal portion of the nerve, whether in the lower or in the upper portion of the face, argues for a peripheral or ascending nerve involvement.

Oral examination in the National Leprosarium has revealed the presence of complete loss of sensation occurring on the mucous membrane of the right cheek with diminished sensation on the left cheek. Complete or diminished anesthesia has occurred on the mucous membrane of the upper lip with dimin-

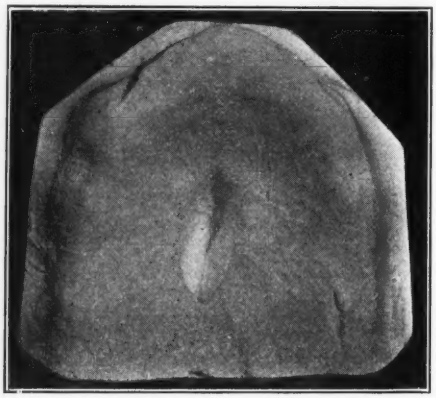

Fig. 1.—Perforation of palate. Case before operation.

ished or no anesthesia on the lower lip. In several cases there has been complete loss of sensation on the lingual aspect of gum tissue on one side of the arch limited to a certain area to such an extent that no local anesthesia was required lingually for the extraction of bicuspids and molars. However, in no instance has complete anesthesia been observed buccally or labially.

The senses of taste and smell have been deficient in some patients; one point of interest is that taste is not found to be absent so frequently as is met with in ordinary types of facial paralysis not attributed to leprosy. As a result of paralysis, drooping of the upper and lower lips has been observed.

The sensation of pain is tested with point of needle and the sense of pressure by the application of a blunt instrument. In testing superficial touch sensation the patient is blindfolded, various parts are then touched with a spill of paper and the patient is asked to indicate accurately with one finger the part touched. The advantage of this method over the one usually adopted, that of asking the patient whether he feels the part being touched or not, will at once be evident.

Fig 2.—Leprosy with carcinoma of nose, not attributed to leprosy; hence malignant differing from leprous growth, in not being granulomatous. Carcinoma was removed.

Fig. 3.—Leprosy, mixed type; complete blindness from corneal involvement; absorption of bone and cartilage of nose; complete loss of sensation of lower lip, diminished sensation of upper lip. There is in this particular case complete loss of sensation of mucous membrane of cheeks and complete loss of sensation on left side of hard palate where no local anesthesia was necessary lingually for the extraction of bicuspids and one molar.

The perforating ulcer, a common lesion of the maculoanesthetic type, has been found in the vicinity of the soft palate in some rare instances. It is, however, very common on the feet of individuals where the nerve type predominates. Perforating ulcers are classed as trophic ulcers and are the result of severe trophic disturbances. In a severe reaction the nerves become thickened, congested and tender; patients cannot bear the slightest pressure along the course of the nerves. If the reaction becomes less severe, the patient complains of neuralgic pains. The symptoms of nerve irritation are manifested in the lesion supplied by the nerve trunk. Bacteriologic examinations show far fewer *B. leprae* present in nerve lesions than in nodular lesions.

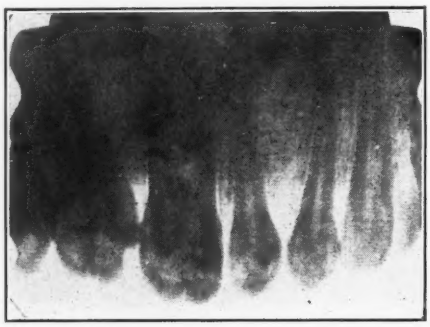

Fig. 4.—Leprous absorption of the alveolar process accompanies lesions in the oral cavity. This, in my opinion, indicates mixed type of leprosy.

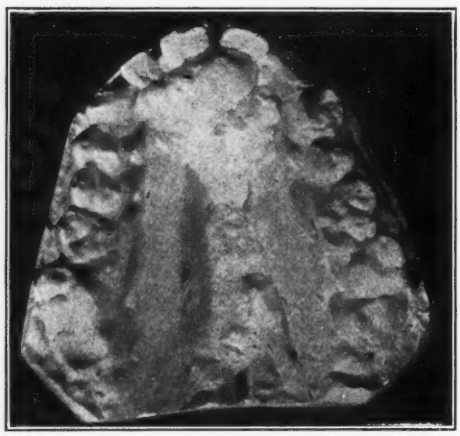

Fig. 5.—Leproma lingually of maxillary anterior teeth, with diffuse thickening extending posteriorly; there is healthy or normal tissue adjacent to molars.

Nodular leprosy is characterized by the presence of leproma and ulcerations. Leprous granulomas are not uncommon. The roof of the mouth is their most frequent location. This type of lesion is generally found in the advanced type of the predominant nodular leprosy or when the type becomes the mixed type.

When the leproma is present in gingival margins lingually of maxillary incisors, its severity is increased by the accumulations of foreign substance or other irritants causing the tissue to hypertrophy, covering the lingual fossa and sometimes the entire lingual surfaces of incisors. Lesions of this type are hypersensitive, and patients experience much discomfort when eating highly seasoned

foods. Nodules appear on the outer margins of the lips, while in some of the advanced types nodulation of the tongue is common.

The palate may be the site of diffuse nodular lesions. The soft palate and the fauces become ulcerated as a result of disintegrating nodules, and, when ulcers heal, partial obstruction of the fauces may result.

### PHASES OF LEPROUS LESIONS

In most systemic bacterial diseases the onset of toxic symptoms coincides with the multiplication of bacteria. In leprosy the onset of toxic symptoms does not necessarily coincide with the multiplication of bacilli, nor is their severity in direct proportion to the number of bacilli. Patients with far fewer bacilli may suffer from the symptoms of general toxemia with high fever and all the signs of an acute illness; this acute condition is to a greater or less extent accom-

Fig. 6.—Bilateral facial paralysis. Case before operation.

panied by inflammatory reaction in one or more of the lesions. Such reactions may come on suddenly or gradually, may last for a longer or shorter period, and may recur at longer or shorter intervals. Each reaction is followed by certain changes in those lesions which have taken part in the reaction. These changes have been recognized clinically and bacteriologically and are in proportion to the severity of the reaction.

A leprous lesion may be described as passing through three phases: (1) the quiescent, during which the bacilli may multiply and the lesion extend locally, but during which there are no general toxemic symptoms; (2) the reactionary or inflammatory, during which lesions become inflamed and general toxemic symptoms appear; and (3) the phase of resolution following upon the subsidence of reaction. In some cases these phases are well marked, recurring at longer or shorter intervals, and the various lesions may react, either all together or in groups, the reactions sometimes affecting a whole lesion and at

other times singling out certain parts of a lesion. In other cases reactions are not well marked, and the lesions may pass into the phase of resolution without having passed through a phase characterized by noticeable local inflammatory signs or general toxemic syndromes. It has been observed that lesions of a leprous nature do not disappear so rapidly as do lesions of a nonleprous nature. The scars of once active leprosy may show long after the disease has disappeared. They are more marked on the skin surfaces than on the mucous membrane.

SUMMARY

Smears made from oral and extraoral lesions and sections obtained from tissue constitute a useful aid to diagnosis. Stained by Ziehl-Neelsen's carbolfuchsin method, they reveal the presence of organisms morphologically and tinctorially resembling the bacillus Hansen.

In many cases swollen and enlarged lips accompany severe cases of leproma lingually or maxillary anterior teeth.

Nerve affection in leprosy is of the ascending type affecting the terminal branches of the fifth and seventh cranial nerves.

There is an interrelationship between nodular and nerve leprosy. (1) The more the nodular type is manifested, the less show symptoms of the nerve type. (2) Nerve lesions are associated with comparative paucity in the number of bacilli; consequently the earlier lesions are of the nerve type.

Partial obstruction may be caused by healing of ulcers resulting in the buttonhole mouth, as it does in the region of the epiglottis, fauces and focal cords. It may be so severe that tracheotomy has to be performed to prevent the patient from dying of asphyxia. Perforation of the palate has occurred in many cases in leprosy, but it may be looked upon as a result of accompanying syphilis.

Periodontoclasia is present in all three types of leprosy. It is more prevalent in cases which the nodular type predominates, due apparently to association with mouth ulcers and leprous granuloma. There seems to be more pyorrheal absorption in cases in which the nerve type predominates. It must be remembered that bone absorption is a lesion of the nerve type, so prevalent in hands and feet, and it is etiologically due to constant infiltration and inflammation of the nerves, resulting in interference with nerve function.

It has been observed that complete repair of secondary lesions in the mouth has occurred following extraction of infected teeth.

Restoration of teeth lost as a result of leprous degeneration, such as paralysis, leproma and ulcerations, and extensive absorption requires skill, for mouths having undergone such degenerative changes present quite a diversity of form and deviation from normal.

The severity of bone atrophy is increased by various lesions affecting the mucous membrane of the oral cavity. Ninety-eight per cent of cases that show oral leprous lesions, radiographically reveal bone atrophy of the alveolar process. Many theories have been advanced as to the etiology of muscular and bone atrophy in lepers, but it is my opinion that bone and muscular atrophy are caused by constant infiltration and inflammation of the nerves, resulting in interference with nerve functions.

# LABORATORY EXAMINATIONS IN DIAGNOSIS OF DENTAL AND ORAL DISEASES

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THE development of a biologic background for dentistry during the last decade or two has opened the door for a broader application of laboratory examinations in the diagnosis of dental and oral diseases. Laboratory tests should be made part of every complete examination, just as the internist uses them in every case he studies.

Patients consulting a physician do not object to urine analyses and blood counts. They seem to accept these methods as the customary procedures, and also, perhaps, because the etiology of somatic symptoms is so often obscure.

When laboratory tests are made for the diagnosis of dental complaints, a certain amount of education of the patient may be required for a while. The feeling still persists that dental and oral diseases are only local affections; therefore an explanation is necessary to make the laity understand that there may be present important predisposing or contributory factors of a general nature, or somatic diseases which affect the defensive mechanism of the teeth and oral mucosa, and the process of repair. It is the lack of this understanding by the patient and also on the part of the practicing dentist that has prevented laboratory tests from coming into general use as rapidly as they should. The failure to apply them more frequently has, without doubt, been an outstanding impediment in the development of new methods for combating and preventing dental and oral lesions.

I have great hope that rapid progress will be made in the introduction of laboratory tests, first, through establishing in dental schools a course in diagnosis such as outlined by the Curriculum Survey Committee of the American Association of Dental Schools, and, second, through the agency of diagnostic clinics in dental infirmaries through which all patients will be admitted. In these clinics new laboratory examinations could be tested and evaluated. A large amount of statistical material could be collected leading to a better understanding of many of the common dental diseases, which, at present, are not yet under control. The undertaking would help to create further interest for biologic studies and research, especially if the knowledge gained by the application of fundamental principles yields results useful in the practice of dentistry.

Today no one doubts the necessity of serologic examination if syphilis is suspected, or the importance of taking smears of ulcerations of the gingivae for bacteriologic examination. I am convinced that other methods, some of which are already in the experimental stage, may become very important in the future and may even help to develop new therapeutic measures of a value that can scarcely be conceived at present.

It is evident that laboratory examinations when instituted as routine measures will not always be of immediate benefit to every individual case, but it assures the patient that no general condition will be overlooked. This is important in practically all phases of dentistry, and prevents endless and useless symptomatic treatments, which generally yield no permanent result. For example, the patient with parodontal disease may be suffering from diabetes, nephritis, gastrointestinal autointoxication; the patient with jaw deformities and malocclusion may be disabled by rickets, chondrodystrophia, Barlow's disease, or congenital syphilis; patients presenting ulcerations and new-growths in the oral cavity may be afflicted by blood dyscrasias (such as myelogenous and lymphatic leucemia, various forms of anemia, thrombocytopenic purpura, agranulocytic angina); or have acquired endocrine disturbances (such as hyperparathyroidism, acromegaly); or suffer from specific infections (such as tuberculosis, actinomycosis, acquired syphilis, blastomycosis); or medicinal and chemical reactions (such as caused by various drugs, and metals as lead, mercury, and radium).

Laboratory tests that are now at our disposal and may be used to investigate dental and oral diseases are:

Determination of the neutralizing power of saliva.
Determination of the immunizing power of saliva.
Determination of ability to inhibit specific bacterial growth.
Determination of conditions of saliva which favor bacterial development.
Examination of smears to determine mouth flora, especially organisms which cannot be cultivated.
Culture and classification of mouth flora.
Quantitative determination of *Bacillus acidophilus.*
Bacteriologic examination of cases of pulp and periapical infections, and the checking of therapeutic results.
Special bacteriologic examinations (special stains, dark field).
Serologic examination (Hinton, Kahn, Wassermann tests).
Skin tests for allergic reactions.
Blood chemistry for serum phosphorus, blood calcium and phosphatase.
Urinalysis for excretion of phosphorus and calcium.
Urinalysis for albumin, sugar, urea, bile, diacetic acid, acetone, pus cells, casts, and bacteria.
Saliva analysis for acidity, phosphorus, and glycogen.
Galvanometric tests in cases of suspected galvanism.
Blood count for red and white cells, and differential.
Blood coagulation and clotting time.
Blood sedimentation tests in focal infection.
Roentgen study of excised tumor.
Pathologic study of biopsy material and tissue excised at operation.

This list is by no means complete, but it serves to illustrate that there are many tests which have been accepted and are of undisputed worth, while others at present are of only academic value. When used in routine examination, however, the latter may lead to the accumulation of important information.

# Department of Orthodontic Abstracts and Reviews

Edited by
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**Functional Orthodontic Therapy** (Funktions-Kieferorthopädie). By Prof. Dr. Viggo Andresen and Prof. Dr. Karl Häupl, Leipzig, 1936, Hermann Meusser.

In reviewing this volume it is interesting to compare it with another textbook on orthodontia that has recently been published. The object of these books is an instruction in the treatment of the same disorders, but the methods recommended in the two books are radically different. In Strang's book* are recommended appliances of a highly complicated character, attached to almost all the teeth by means of specially constructed cemented bands and, accordingly, impossible for the patient to remove. Andresen and Häupl in their *Functional Orthodontic Therapy* recommend the exclusive use of removable appliances with a variety of springs and inclined planes, but without any kind of cemented bands.

The difference is by no means restricted to the construction of the appliances. Whereas the appliances recommended by Strang exert force on the teeth by means of direct spring action, etc., the active force used by Andresen and Häupl is derived from the pressure of mastication and similar muscular sources, and this force is transmitted to the teeth by the medium of the removable appliances. The authors assert that their methods are more in accord with physiologic demands than those of previous orthodontic systems, and they have accordingly named it "biomechanical activating therapy" (biomechanische aktivierungstherapie).

Both systems are fundamentally different, but each of their advocates states that his method is the better. When leading authorities differ so much, how is the operator to decide which method to select?

It has often been said that when two schools have opposite opinions it is probable that the truth is to be found somewhere midway. But the remarkable thing is that the extreme position both schools hold is quite legitimate if we study the different conditions for which the methods are worked out. The advocates of cemented appliances state that in order to be able to move a tooth properly, you have to grip it tightly, and this is often possible only by means of cemented bands. If they are not used, the result will be correspondingly imperfect.

During our work with fixed appliances, do we not often find to our disappointment that it is necessary to increase the number of cemented bands, if the desired result is to be obtained? Or, is it the opinion of Andresen and Häupl that the use of cemented bands is unnecessary? It appears evident to

*Strang, Robert H. W.: A Textbook of Orthodontia, Philadelphia, 1933, Lea & Febiger.

the reviewer that if we limit ourselves to the use of the appliances recommended by Andresen and Häupl, then we will have to limit our treatment to those cases in which cemented bands are superfluous, or else we must be contented with inferior results. In other words, we must select patients with suitable malocclusions or treat only such patients who are not very particular as to the result.

Even if we admit that the cemented appliances are more effective and definite in their results, they are accompanied by very troublesome drawbacks. One of these is the necessity for the patient to live at not too great a distance from the operator. If we have in mind that a great percentage of children requiring orthodontic treatment live in inaccessible localities, the absolute necessity of treating them with removable appliances is easily understood.

The results published in Andresen and Häupl's book demonstrate that the "biomechanic activating therapy" is reliable even in a number of very disfiguring malocclusions (which does not necessarily mean that they are technically difficult to correct). Accordingly, there is no reason to reject the methods of Andresen and Häupl, even if the patient is living in convenient proximity to the operator. Furthermore, a method using appliances to be worn only at night has such decided advantages that we should consider the possibility of using it for every patient.

The list of treated cases described in the book amounts to sixteen. To the experienced orthodontist it is clear that the tooth movements required in the majority of them are exceedingly simple, especially as extractions or loss of teeth have simplified the problem in eleven of the sixteen cases. This, in the reviewer's opinion, is an indication of the limitation of the method. In one case, an illustration (Fig. 144) intended to show that a tooth had been moved to its correct position proves in reality the opposite and is an illustration of the failure of the method as a means to obtain perfect results.

A treatment method should be a convenience; it should not become an aim in itself or become master instead of servant. If we limit ourselves to the methods of the biomechanical activating therapy, we thereby limit the possibilities of our specialty, avoid certain cases, and content ourselves with imperfect results in others which are not suitable for the method. For a school of orthodontia to limit instruction to the "biomechanical activating therapy" would be as great a mistake as to ignore it altogether. The authors' enthusiasm for their ideas and for their system is natural, but it seems probable that, in their more sober moments, they will admit that there are also other methods that cannot be dispensed with.

One of the authors, Prof. Andresen, declares that the objective of treatment is a "functional and cosmetic optimum." Whenever he mentions this, he adds his name in brackets, apparently believing that he has a right of priority to this statement. But is this suggestion really anything new? From the writings of Angle we may readily find that he always aimed at attaining what certainly was equivalent to a functional and cosmetic optimum; the only difference was that he imagined that he could, by means of "normal occlusion," attain both these objectives, which in reality represent two different things.

Prof. Andresen has worked out a special method for deciding what the functional and cosmetic optimum for the individual case is. By means of what he calls gnathophysiometry (Gnathophysiometrie) and a method, "Die Gnathophormethode," he decides what ought to be done. He clearly states that the object of these is not merely to describe certain facial types. The data obtained are to give directions for the treatment.

It would take too much space to give the details; the reader is referred to the book. The author uses a system of lines on the profile. When the line connecting nasion, centrale, and gnathion is straight, the facial type ought to be classified as a "harmonious gnathophysiognomy," whatever the angle to the plane of Campers. Otherwise, there is a "dysgnathous variation."

How has the author arrived at this conclusion? Probably profiles have been selected which have in the author's opinion been "in harmony," and an examination of them has given the above mentioned characteristics. In this method of diagnosis there is a very uncertain factor; namely, what proportions are harmonious. Moreover, it is by no means certain that what to the operator seems an esthetic optimum must, of necessity, be the functional optimum. If treatment is planned on esthetic grounds, which must be the case when the "Gnathophormethode" is employed, it may be at the expense of the functional optimum. In some cases this may perhaps be excused. However, in others disastrous results may be the outcome of orthodontic operations which are sacrificing an existing perfect occlusion or desisting from trying to attain it in order to effect an harmonious "gnathophysiognomy."

It seems evident to the reviewer that the "Gnathophormethode" may, in the same way as Case's and Simon's methods, become the cause of faulty treatment. The gnathion's position in the profile is no reliable evidence as to the sagittal position of the mandibular arch. As has been shown by Lischer, it varies in individuals who have the same mesiodistal occlusion, consequently also in cases of distoclusion. If we are to take Prof. Andresen's diagnostic system seriously, we shall have to let the position of the gnathion decide if it is the movement of the maxillary or mandibular teeth that is indicated in a case of distoclusion.

While the treatments of distoclusion vary according to the objective of the operator, the final results show a difference in the mesiodistal position of the gnathion of at most 4 mm. in deciduous dentitions and seldom more than 6 mm. in full grown individuals (at least in cases not mutilated by loss of teeth). Is not the attainment of the best functional occlusion worth a few millimeters' difference in the position of the gnathion? In our literature we find shocking examples of faulty treatment as a result of profile diagnosis when it was taken literally.

In the chapter on general remarks as to the nature of the "Functional Orthodontic Therapy" (Funktions-Kieferorthopädie) and as to the objective of treatment, the removal of teeth, etc., the authors give the following information: the biomechanic appliances are activated solely by means of the function of the masticatory muscles. Opportunity is given to produce physiologic, intermittently acting, stimulations sufficient for the rebuilding of the structures, etc. Not only the paradentium and the jawbone, but also the

muscles are influenced in a favorable manner. The changes of the muscular function and structure produce a permanent active retention mechanism for the changed form of the jaws. In cases of distoclusion the protractors, and in cases of mesioclusion the retractors, are developed. A hypertrophic development of the tongue is effected, making it a permanent natural retaining mechanism.

According to the authors' comments everything appears very encouraging. We seem to recognize—not the identical details—but the manner of reasoning, of Angle's "natural philosophic" arguments, but we find also that Prof. Andresen's statements are accompanied by even less evidence in the form of practical results.

As has been mentioned previously, the case histories published in the book refer almost exclusively to cases requiring the simplest tooth movements. But when the authors enumerate all the wonderful changes which are ascribed to the effect of the biomechanic methods, and which attain their climax in the declaration that the remodeling of the jaws is permanent, they ought to prove this by evidence. No attempt is made to do this. The evidence produced amounts to this: it is possible in a number of cases requiring simple tooth movements to accomplish these with removable appliances. Regarding the permanency of the results, which the authors state to be effected by means of their special functional method, no evidence whatever is produced.

Even with these limitations, there remains sufficient of value to make the textbook of Andresen and Häupl a very remarkable addition to the literature of orthodontia. It is no small matter to have devised a method of treating certain malocclusions with removable appliances, thereby extending greatly the field of orthodontic treatment. The book is accordingly worthy of careful study by all operators interested in orthodontia. The reviewer is convinced that it will find a wide circulation, and it is most desirable that it be translated into other languages. In this latter case it is the reviewer's opinion that it would be an improvement if the authors would carefully revise certain parts of their, in other respects, important and valuable contribution.

*Axel Lundström.*

# International Journal of Orthodontia and Oral Surgery

PUBLISHED THE FIFTEENTH OF EVERY MONTH BY

THE C. V. MOSBY CO., 3523-25 Pine Blvd., St. Louis, Mo.

**Foreign Depots**—*Great Britain*—Henry Kimpton, 263 High Holborn, London, W. C.; *Australasia*—Stirling & Co., 317 Collins Street, Modern Chambers, Melbourne; *India*—"Practical Medicine," Egerton Street, Delhi; *Porto Rico*—Pedro C. Timothee, Rafael Cordero 68, San Juan, P. R.

**Subscription Rates**—Single Copies, 75 cents. To any place in United States, Cuba, Porto Rico, Canal Zone, Mexico, Hawaii and Philippine Islands, $7.00 per year in advance. To Canada, $7.50; under foreign postage, $8.00. Volume begins with January and ends with December of each year.

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Entered at the Post Office at St. Louis, Mo., as Second Class Matter


# Editorial

## Looking Ahead

THE economic and social life of America is rapidly changing, and all departments of medical and dental practice must necessarily change to meet the health requirements of the new order. In the future, health service is to be available to all the people, as education is now available to all children. The orthodontists of the country realize that within their own organization they must plan to extend their services to reach larger groups of the people. In New York at the meeting of the American Society of Orthodontists in 1935, President L. M. Waugh emphasized that great efforts must be made to make services available to all children who need them. At that meeting it was pointed out that orthodontia must not be provided for privileged children alone.

A Socio-Economic Committee has been appointed by the Executive Council of the Society to make recommendations at the next annual meeting of the Society as to ways and means of extending competent orthodontic service to more people, in conformity with the trend of the times in all health service. The committee is composed of T. W. Sorrels, Oklahoma City, Chairman; Harry Allshouse, Kansas City, Mo.; and Russell Irish, Pittsburgh, Pa.

In conformity with the duties outlined for this committee, the chairman of the Socio-Economic Committee of the American Society of Orthodontists inquired of both the Democratic National Headquarters and the Republican National Headquarters to ascertain the attitude as manifested by the platforms and the principal candidates toward state medicine and dentistry. The Democratic Headquarters has called attention in its reply to the fact that the President has gone on record as commending the medical and nursing professions in taking the attitude that they must do more in times of sickness to help the families with small income, and that he has praised the physicians of the nation for all they have done during the depression, often at great sacrifice, in maintaining the standards of living for the sick, and have devoted themselves without reservation to the high ideals of their profession.

It is pointed out that the medical profession has been admonished by the President that it can rest assured that the Federal administration contemplates no action detrimental to the interests of the profession and that the action taken in the field of health as shown by the provisions of the Social Security Act, recently enacted, is clear. The President said that the four provisions in the Social Security Act which deal with health received the support of outstanding physicians during the hearings before Congress; and the American Medical Association, the American Public Health Association, and the State and Territorial Health Officers' Conference made it plain that they were in full support of the public health provisions, and that the American Child Health Association and the Child Welfare League had endorsed the maternal and child health provisions. He indicated that the health plans will be carried out in a manner compatible with the traditional social and political institutions of America, and that all states and territories are now cooperating with the public health service. All states except one are cooperating in maternal and child health service; all states but ten in service to crippled children, and all states but nine in child welfare.

The President made it plain in his Jersey City speech (October 2, 1936) that the Social Security Act has enthusiastic public support and that it contains precautions for assuring the continued support of the medical professions. He said that the government will call on the physicians of the nation for advice in days to come and that an overwhelming majority of physicians are of the opinion that medicine should be kept out of politics; but on occasions in the past such attempts have failed and probably will always fail in this regard.

On the other hand, the Republican reply indicated the attitude of the party, calling attention to the article "Politics and Medicine" which appeared in the August issue of *The American Interne*. It was pointed out in a

letter to the Chairman of the Socio-Economic Committee that this article gives a thorough review of the stand of Republican candidates on this question.

"The Republican party has never believed in turning a noble vocation such as medicine into a government controlled 'public utility.' This has been tried in other countries and has proved to be a failure; although there are some members of this profession who feel that they would be benefited by a complete socialization of medicine. They would undoubtedly be sadly disillusioned if such a course were put into effect, for political pressure and influence would sooner or later have disastrous results."

Enclosed also were quotations from the editorial "Politics and Medicine," in which is pointed out very aptly the Republican stand on socialized medicine. Space will not permit the reprinting of that editorial in full; the following are a few remarks of Gov. Alfred M. Landon, Republican nominee for the presidency, when he addressed the opening session of the American Medical Association at Kansas City in May. "Medicine will not willingly be made the servile instrument of politicians or the instrument of domineering bureaucracy. I predict that the typical American physician and organized medicine as a whole will at no time be ready for any scheme of regimentation, for any system of impersonalized medicine which is totally alien to the best traditions of the American practitioner and of the profession as a whole. The American practitioner will not be a party to the destruction of that individual, personal service which has been the occasion of a special and justifiable pride. Whatever further advances are made in the broadening of medical service—there will be an abundance of them—will be made in accordance with the fundamental conditions of previous achievements. A nation that can maintain and even elevate its medical standards and the state of public health in the trying years of a prolonged depression needs to make no apology for the quality and the reach of its medical facilities.

"That condition itself is a tribute to the American physician in his continued unselfish devotion to a worthy task. May you long abide in your loyalty to the ideal of individual, personal ministration. From the earliest days the general practitioner in America was, first of all, an individualist. The circumstances of his work made him that, but it was a fortunate situation for the people who needed medical care. It meant that they could have personal ministration, that there was an intimate relationship between physician and patient and that the sufferer became at once, and remained, the object of very special attention. Down to the present day, American medicine has continued to be primarily individualistic. It is chiefly on that basis that it is to be distinguished from medicine in many foreign countries. I know very well the arguments for an extension of the best medical service to all groups of the American people. It is a worthy cause. It is enlisting the attention of the best brains of your profession. I have confidence that you will work it out."

It is of interest that no definite plan is outlined at present by either party; however it is plain that each party is acutely alert to the question of

socialized medicine, that both are fully aware that the subject ties in to the Social Security Act, and that socialized medicine may become the next big move in connection with social security.

The healing arts have gone far under the present system. There is pride of achievement, pride of calling, and pride of distinction for the professional man under the present system of operation of medical practice. In the event of socialization men of less ability and of a poorer type will be attracted to the practice. There will be the job-holding and job-hunting approach to practice. Pride of accomplishment and inspiration in medical practice will fly out the window, and a fascinating and scientific department of human endeavor will become only another job for another group of workers.

*H. C. P.*

# News and Notes

## American Society of Orthodontists

The thirty-fifth annual meeting of the American Society of Orthodontists will be held at the Edgewater Beach Hotel, Chicago, April 19-22, 1937.

PAUL G. SPENCER, President,
1817 Austin Avenue,
Waco, Texas.

CLAUDE R. WOOD, Secretary,
608 Medical Arts Bldg.,
Knoxville, Tenn.

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## Southern Society of Orthodontists

The fifteenth annual meeting of the Southern Society of Orthodontists will be held at the Atlanta Biltmore Hotel, Atlanta, Ga., on January 25, 26, and 27, 1937. All ethical members of the dental and medical professions are cordially invited.

WILLIAM A. CLARK, President,
Medical Arts Bldg.,
Atlanta, Ga.

WILLIAM P. WOOD, JR., Secretary,
442 West Lafayette Street,
Tampa, Fla.

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## North Atlantic Orthodontic Society

The next meeting of the North Atlantic Orthodontic Society will be held in New York City, Wednesday, December 16, at the Hotel Pennsylvania.

Registration will be held at 9:30 A.M. The morning session will consist of case reports and an essay; the afternoon session, of table clinics; and the evening session will be devoted to two essays.

Members of the dental profession are cordially invited.

JAY M. CORNELL, President.

EDWARD A. LUSTERMAN, Secretary,
185 West End Avenue,
Brooklyn, N. Y.

## European Orthodontological Society

The next meeting of the European Orthodontological Society will be held in Brussels on May 17 and 18, 1937, under the presidency of Dr. Lucien De Coster. The Headquarters will be at the Palace Hotel. The scientific meetings will be held in the new Eastman Clinic buildings, by courtesy of Dr. Watry.

Communications from those who desire to contribute to the program may be addressed to

G. F. CALE-MATTHEWS, Hon. Secretary
95, Newhall Street
Birmingham, 3, England.

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## Dental Society of the State of New York

Because of unforeseen circumstances which have arisen, the date for the Sixty-Ninth Annual Meeting has been changed from May 11-14 to May 4-7, 1937. Headquarters will be at the Waldorf-Astoria, New York City.

CHARLES A. WILKIE, Secretary
233 Bible House
New York, N. Y.

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## North St. Louis Dental Society

The Eighth Annual Meeting will be held at the Chase Hotel, January 27 and 28, 1937.

A. C. MOGLER,
4482 Washington Blvd.
St. Louis, Mo.

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## Great Lakes Association of Orthodontists

The annual meeting of the Association was held at the Royal York Hotel in Toronto on October 19 and 20. The following program was presented.

"Address of Welcome" by H. J. Cady, President of the University of Toronto; "Response" by Varney E. Barnes, Cleveland; "President's Address" by G. Vernon Fisk, Toronto; "The Biologic Aspect and Its Practical Application in Orthodontic Treatment" by Milo Hellman, New York City; "Case Report" by Bruce Foster, Detroit; "The Importance of Mechanics in Orthodontic Treatment" by George W. Grieve, Toronto; "Treatment of Class II, Division 1 in a Boy 17 Years Old" by Willard Gray, Rochester, N. Y.; "Orthodontic Suppositions" by W. W. Woodbury, Halifax, Nova Scotia; "Extending the Scope of Orthodontic Service" by C. A. Corrigan, Toronto; "Clinical Photography" by Elmer F. Boester, Cleveland; "Coil Springs" by Varney E. Barnes, Cleveland; "Apical Arch Development" by Richard E. Barnes, Cleveland; "Results of Treatment in Orthodontic Clinic, Department of Public Health, Toronto" by C. A. Corrigan, Toronto; "Selected Clinic" by M. R. Culbert, Toronto; "Technic of Construction of Buccal Planes to Stimulate Horizontal Growth of the Mandible" and "Simple Appliances for Assisting Eruption of Impacted Third Molars" by George W. Grieve, Toronto; "Chrome Alloys and a New Lingual Lock" by W. G. Foster, Hamilton, Canada; "Phonetics in Orthodontics" by W. K. Prendergast, Toronto; "Professional Records" by Charles Vosmick, Cleveland.

International
Journal of Orthodontia
and Oral Surgery

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VOL. 22 DECEMBER, 1936 No. 12

# Orthodontia

## AN ORTHODONTIC DIAGNOSIS BASED UPON OSSEOUS STRUCTURES

G. VERNON FISK, D.D.S., TORONTO, ONT., CANADA

THE voluminous literature in recent years upon the subject of diagnosis in orthodontia attests the wide recognition of the necessity of a thorough and painstaking diagnosis before the commencement of orthodontic treatment. A study of the methods indicates that considerable time is consumed in making such diagnoses. Thoughtful reflection, however, will convince us that because of the fact that treatment in many cases is protracted, adequate consideration of a comprehensive diagnostic procedure for such cases is advisable to facilitate successful treatment. Indeed, carefully made diagnoses must form a background for real advance in scientific treatment.

Orthodontic diagnosis appears to have passed through two eras. The first might be termed the era of empiricism. There may be some even today who practice in the empirical era, but such practice produces only indifferent results. These men are like travelers who start on a journey without a well-marked course to pursue and when difficulties or dangers present in unexpected places often have to retrace their steps and start upon an entirely new course—resulting in loss of time to themselves and greater financial outlay to their patients.

Rather than practice in a similar manner, let us study the methods of diagnosis, simplify them if possible, ever remembering that the truly scientific is difficult of simplifications; it must always be thorough.

Read before the American Society of Orthodontists, St. Louis, April 23, 1936.

Let us keep constantly in mind that many of our patients are referred to us by general practitioners of dentistry or medicine, and as a tribute to their confidence in our ability to correct the dental irregularity let us satisfy patient and parent that we are both thorough and scientific. This can be done at the outset through a satisfactory diagnosis.

The second or cephalometric era was prompted by a realization of the inadequacy of empirical methods of diagnosis. During this era were developed both in Europe and in America numerous diagnostic systems of which time does not permit enumeration. Because of its scientific background the method introduced by Simon[1] has received the greatest recognition, at least in America. Like most methods this is based upon measurements taken from the integu-

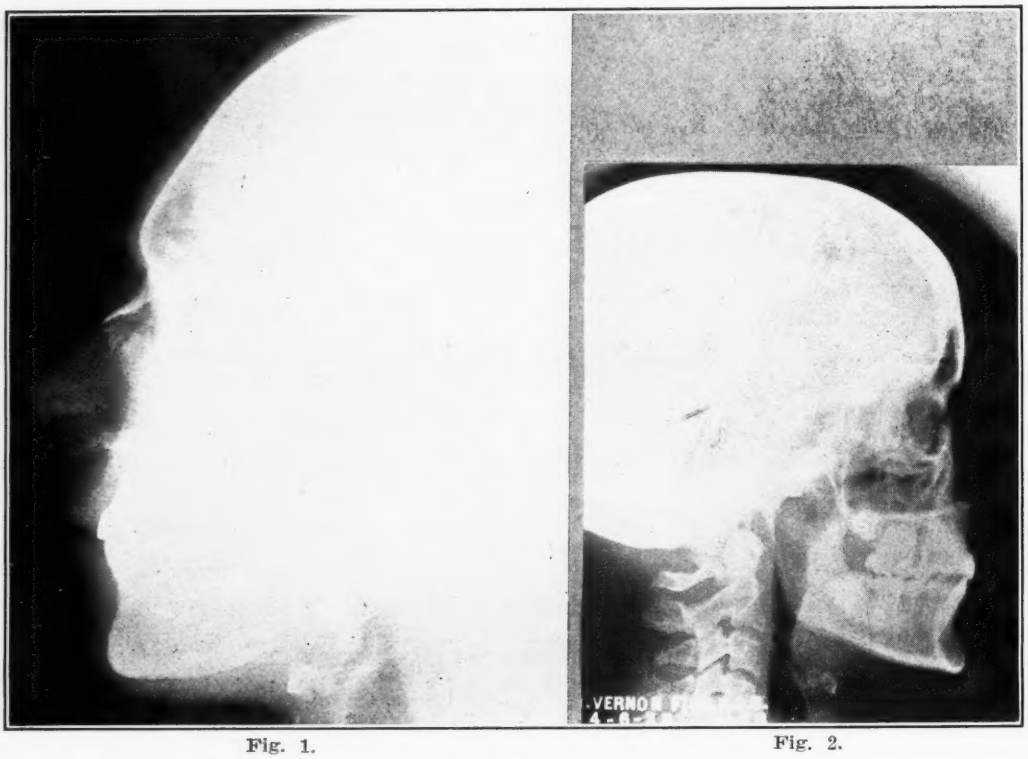

Fig. 1. Fig. 2.

Fig. 1.—Unusual depth of soft tissue overlying maxillae.
Fig. 2.—Unusual depth of integument in the region of the symphysis.

ment. Variation, however, in depth of the soft tissues in different individuals may be demonstrated to constitute a source of error (Figs. 1 and 2). The cephalometric era marks an important advance in the progress of orthodontic diagnosis.

With the development of the Broadbent craniometer, orthodontic diagnosis seems, however, to have entered a third era. With this method not only are the soft tissues registered, but at the same time are outlined the underlying facial bones, the foundation structures for both soft tissues and teeth. Moreover, it provides a simple method of registration of the relationship of the denture to the cranium. It also records upon a plane surface irregular features which are difficult to measure accurately.

Thus it would appear that the optimum in orthodontic diagnosis up to the present has been reached, namely, one upon which a diagnosis may be made from the osseous structures. The extensive use of the roentgenogram makes possible such a diagnosis. Orthodontic diagnosis based upon osseous structures includes:

1. The relationship of facial to cranial structures as revealed in the antero-posterior and profile roentgenograms.
2. Structural variations in alveolar medullary trabeculae as shown in carefully made intraoral roentgenograms.
   (a) Anatomic.
   (b) Osteoporotic.
3. Correlation with other skeletal structures, e.g., the hand.
4. Condylar relationship when necessary.

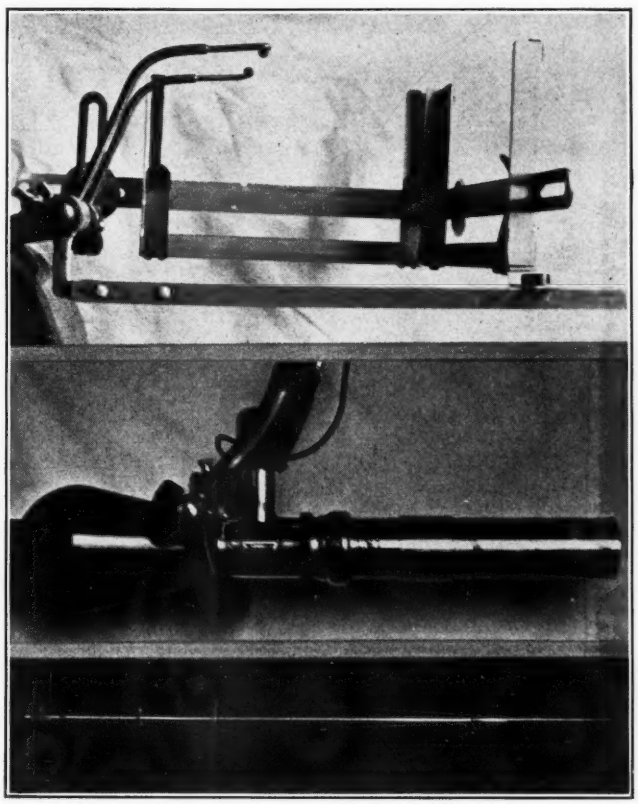

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 3.—The simplified head immobilizer fitted with two cassette holders and attached to dental chair.

Fig. 4.—The diaphragm fastened to roentgen ray tube.

Fig. 5.—The sighting tube which aligns the diaphragm and ear-posts by means of which the tube and the head immobilizer are set at a uniform distance.

## THE RELATIONSHIP OF FACIAL TO CRANIAL STRUCTURES

As many of you are aware, the technic for cranial roentgenology is not difficult. With exposures made close to the subject there is considerable enlargement of the image. Increasing the distance lessens the enlargement until at five feet the enlargement is only about 5 per cent. If, for purposes of

diagnosis, all exposures are made from a five-foot distance from sagittal plane to anode, and the distance from sagittal plane to cassette is kept constant, the enlargement is similar. A comparison of subsequent registrations indicates growth changes in the osseous structures.

Common to all highly specialized scientific instruments a serious handicap to the universal adoption of the Broadbent cephalometer in private practice is presented in its cost. Moreover, the floor space required by the two im-

Fig. 6. Fig. 7.

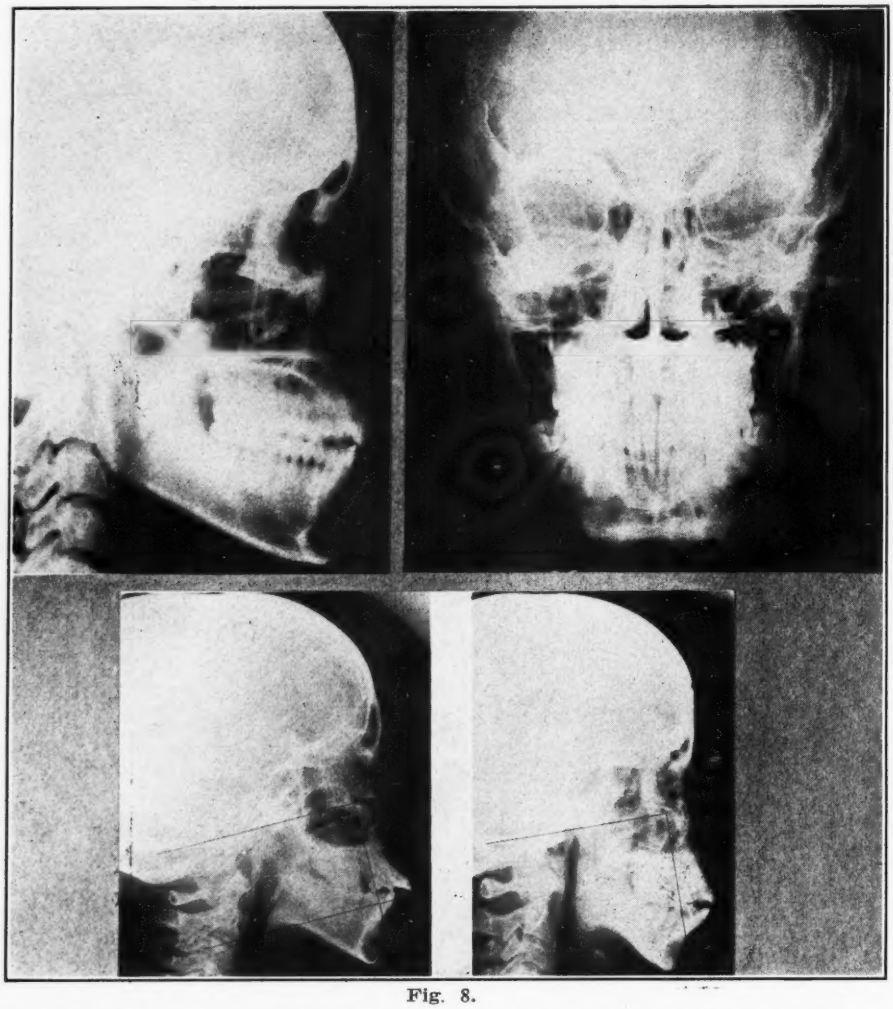

Fig. 8.

Fig. 6.—The profile roentgenogram of a treated case showing the relationship of the denture to the cranium.

Fig. 7.—An anteroposterior roentgenogram.

Fig. 8.—A comparison of the osseous structures shown in a profile roentgenogram of an eleven-year-old girl (left) with that of her mother (right).

movable anodes, each set a distance of five feet from the head immobilizer, presents a further handicap. The adaptation of the standard roentgen ray equipment offers a comparatively simple solution to both problems. When such adaptation is made, no additional space requirement is necessary other than that available in most dental suites.

While such adaptation may detract somewhat from the scientific value of the method, sufficient accuracy is retained to render it extremely valuable in clinical diagnosis. The adaptation of the standard roentgen ray equipment may be accomplished by the addition of the following:

1. A simplified head immobilizer attached to the dental chair (Fig. 3).
2. A diaphragm fastened to the roentgen ray machine (Fig. 4).
3. A sighting tube (Fig. 5).

Fig. 9. Fig. 10.

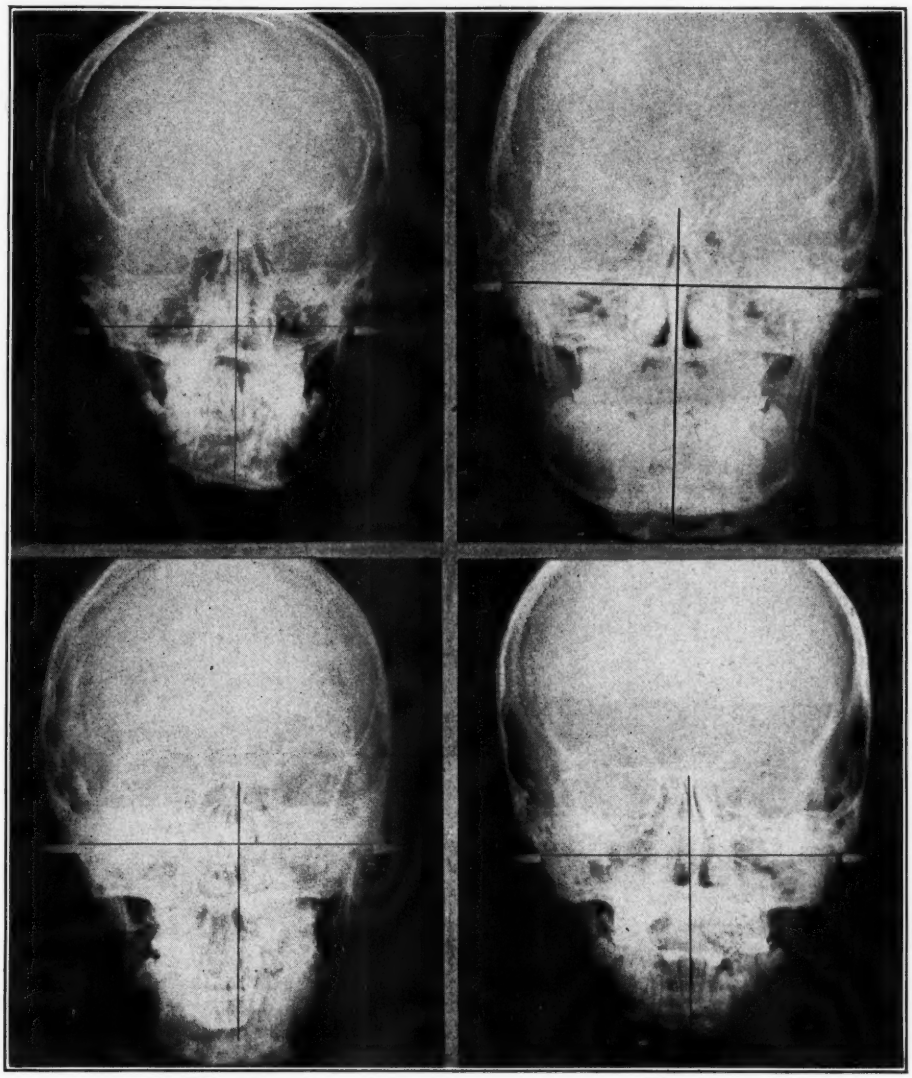

Fig. 11. Fig. 12.

Fig. 9.—Asymmetry in lateral growth of mandible.

Figs. 10, 11, and 12.—The anteroposterior roentgenograms of three children of the same family, all showing asymmetry in lateral growth.

## CRANIAL ROENTGEN RAY TECHNIC

The bakelite cone upon the roentgen ray tube is replaced by the diaphragm which is made level. Similarly, the headrest on the dental chair is replaced by the head immobilizer which is fitted with two cassette holders and ear-

posts, the latter being also made level. The chair is adjusted so that when the back of the chair is tipped forward to its limit, the ear-posts are in the same vertical plane as the rotation axis of the chair. The sighting tube is then inserted into the diaphragm and the tube moved back and forth until the rod attached to the under surface at the end of the sighting tube is flush with the left ear-post which is immovable and the tube locked. This makes

Fig. 13. Fig. 14.

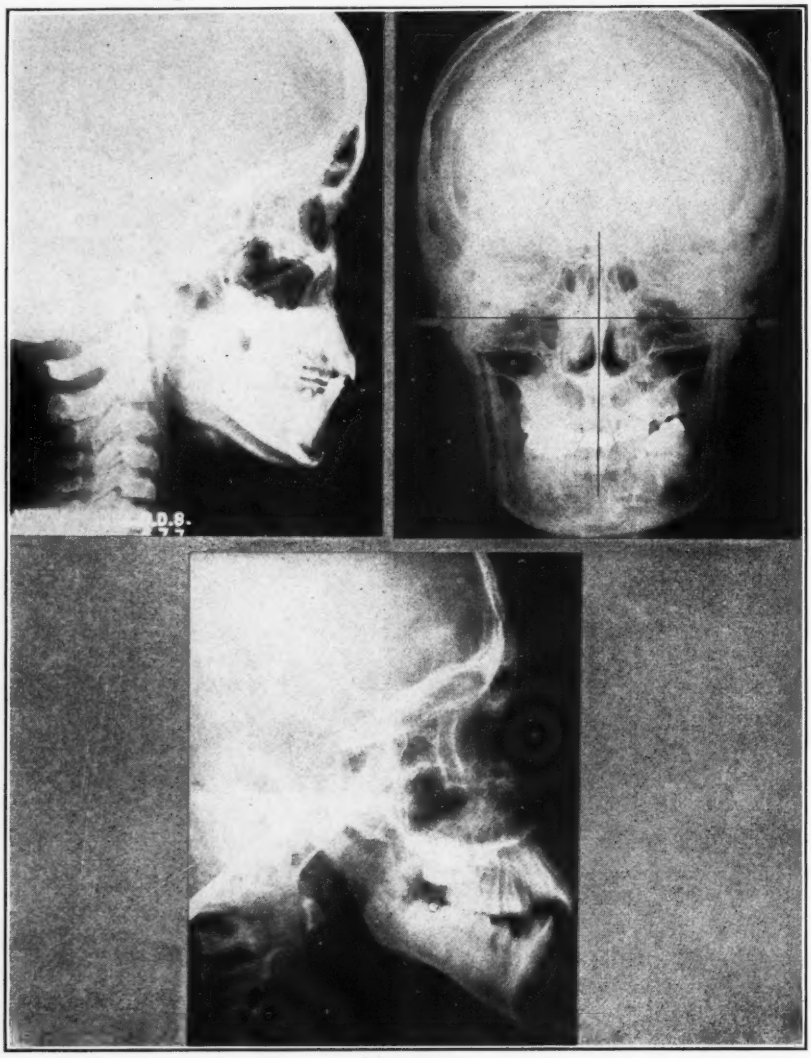

Fig. 15.

Fig. 13.—A lateral view of the case shown in Fig. 12. Note the asymmetry in vertical growth of the mandible.

Fig. 14.—Asymmetry in vertical growth of maxilla.

Fig. 15.—Retarded vertical growth in the nasomaxillary area.

it possible to take subsequent roentgenograms at the same distance. The chair is then raised or lowered until the rod rests under both ear-posts and the chair rotated until both ear-posts are immediately above the rod. With the room darkened and the filament in the roentgen ray tube turned on, the chair and the diaphragm should be so adjusted that the shadow of the ear-

Fig. 16.

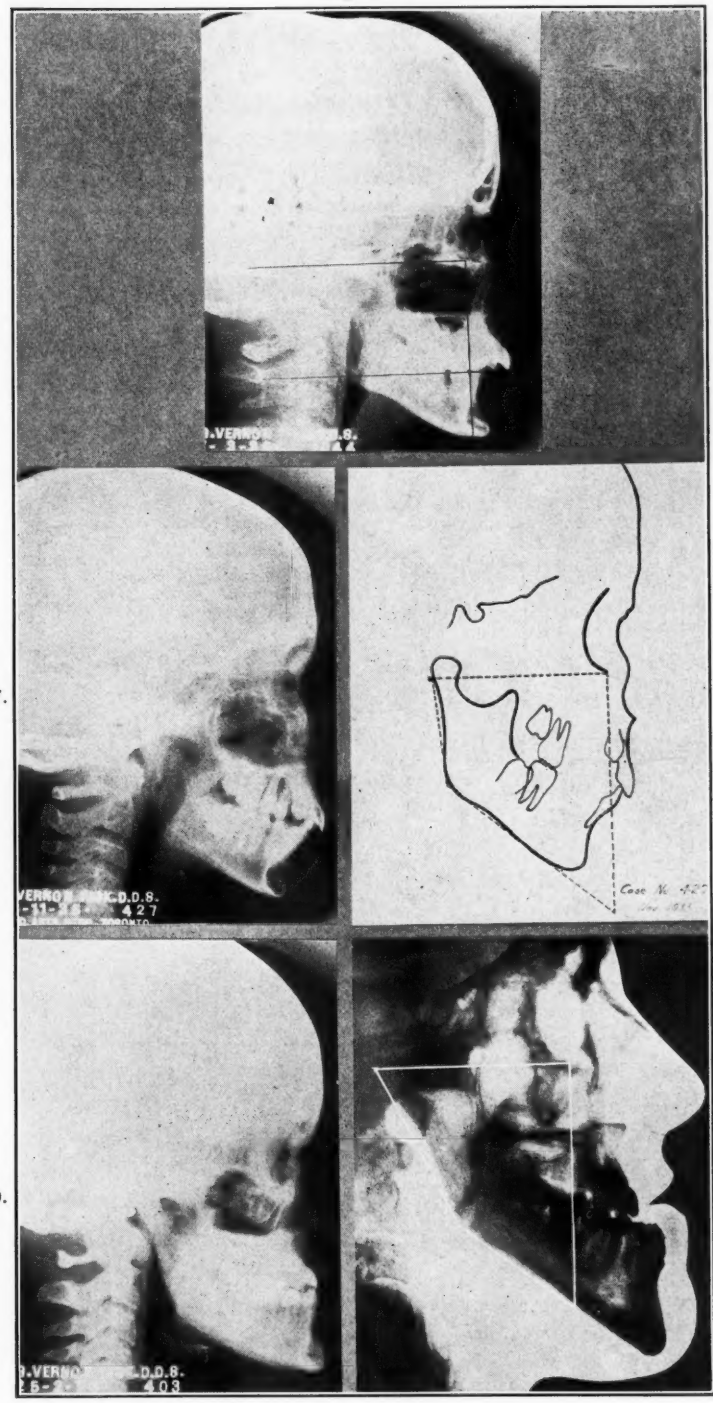

Fig. 17.

Fig. 18.

Fig. 19.

Fig. 20.

Fig. 16.—Asymmetry in forward growth (maxillary alveolar protraction).
Fig. 17.—Asymmetry in forward growth (mandibular alveolar retraction).
Fig. 18.—A tracing of the profile roentgenogram shown in Fig. 17.
Fig. 19.—Asymmetry in forward growth (maxillary alveolar retraction).
Fig. 20.—Asymmetry in forward growth (mandibular alveolar protraction, also maxillary alveolar retraction). (After Hofrath.)

posts is centered in the light beam thrown upon a white cardboard placed in the lateral cassette holder. The chair is locked in this position, the patient seated in the chair, the loaded cassette placed in the holder, and the exposure made. The chair is then rotated through a 90° angle, the position checked with the diaphragm and the anteroposterior exposure made. When possible, in order to conserve time, profile exposures for two or more patients are made before changing the position of the chair, thus avoiding frequent adjustment. Some advantages of cranial roentgenograms are:

1. They indicate the size of osseous structures (Figs. 6 and 7).
2. They provide a means of comparison of the osseous structures of a patient with those of a near relative presenting similar osseous formation illustrating any hereditary tendency manifest (Fig. 8).

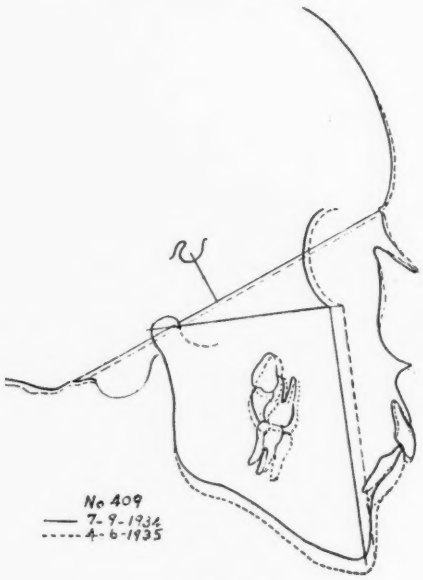


Fig. 21.

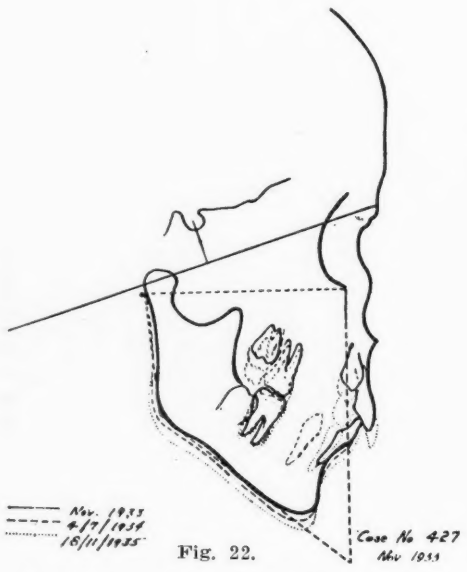


Fig. 22.

Fig. 21.—The growth changes during nine months' treatment in a fifteen-year-old boy.
Fig. 22.—Lack of response to forward growth stimulation of mandible after two years' treatment with intermaxillary elastics. (See Figs. 17 and 18.)

3. They register any asymmetry which may be present.
   (a) In lateral growth (Figs. 9, 10, 11, 12).
   (b) In vertical growth (Figs. 13, 14, 15).
   (c) In forward growth.
      I. Maxillary alveolar protraction (Fig. 16).
      II. Mandibular alveolar retraction (Figs. 17 and 18).
      III. Maxillary alveolar retraction (Fig. 19).
      IV. Mandibular alveolar protraction (Fig. 20).
4. By means of a series of exposures they demonstrate growth changes effected during treatment (Figs. 21 and 22).
5. They aid in the study of relapses (Fig. 23).
6. They reveal the position of impacted teeth (Fig. 24).

7. They offer a method of relating denture reproductions (casts) to the cranium.

RELATING THE DENTURE REPRODUCTION TO THE CRANIUM

After being processed and dried, the anteroposterior registration is placed upon an illuminated view box. With an indelible pencil a line joining the top of the ear-posts is drawn upon the film. Any difference in the distance from this line to the mesiobuccal cusps of the maxillary right and left molars is recorded (Fig. 25). The profile roentgenogram is then placed upon the view box; and the Bolton-nasion, the porion-orbital and left orbital (vertical) planes are drawn upon it. In addition a line parallel with the porion-orbital plane is drawn posteriorly from the tip of the maxillary left incisor (Fig. 26). The distance from this line to the tip of the mesiobuccal cusp of the left molar is also recorded. From these measurements the capital of the denture repro-

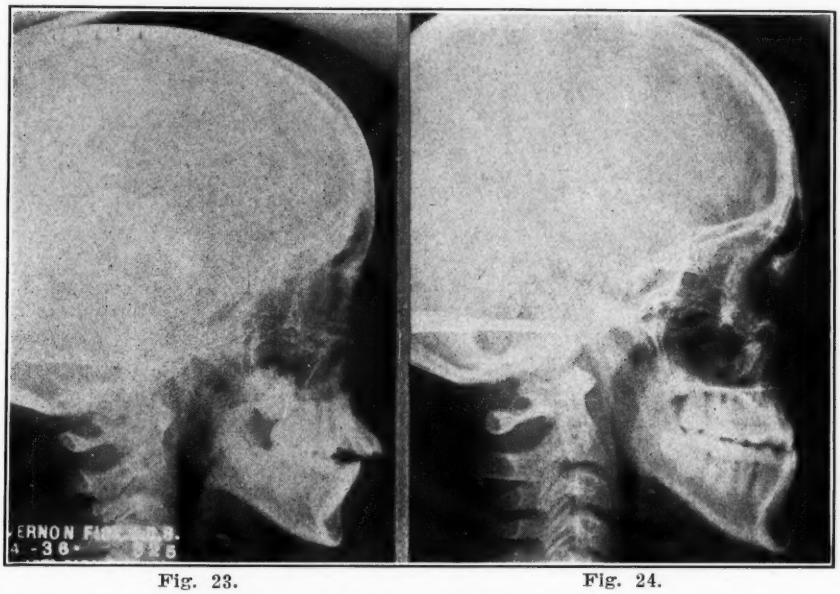

Fig. 23. Fig. 24.

Fig. 23.—Anterior migration of maxillary incisors following removal of appliances. (Note apparent retarded vertical growth in premaxillary area.)

duction may be related to the plane intersecting the two porions and the left orbit. The base of the denture reproduction is then made parallel to the capital.

This method differs from the Simon technic in that it makes no allowance for variability of the right orbit from the plane thus established.

However, limited experience in the orientation of the profile roentgenograms upon the Bolton-nasion plane as described by Broadbent[3] seems to provide a more stable base (Fig. 27). A method of relating the denture reproductions to the Bolton-nasion plane would be of further assistance.

VARIATIONS IN THE ALVEOLAR MEDULLARY TRABECULAE

The delineation of these osseous tissues alone is not sufficient for a complete osseous structure diagnosis. The variation in the internal architecture of the alveoli may be particularly significant. In order that a proper evalua-

tion of these variations may be made, it is necessary to have an understanding of the appearance of normal alveolar bone which MacMillan[4] describes as follows:

*Normal Alveolar Bone.*—"A normal adult alveolar process is found only in specimens or patients whose occlusal surfaces show degrees of wear. . . . .

Fig. 25. Fig. 26.

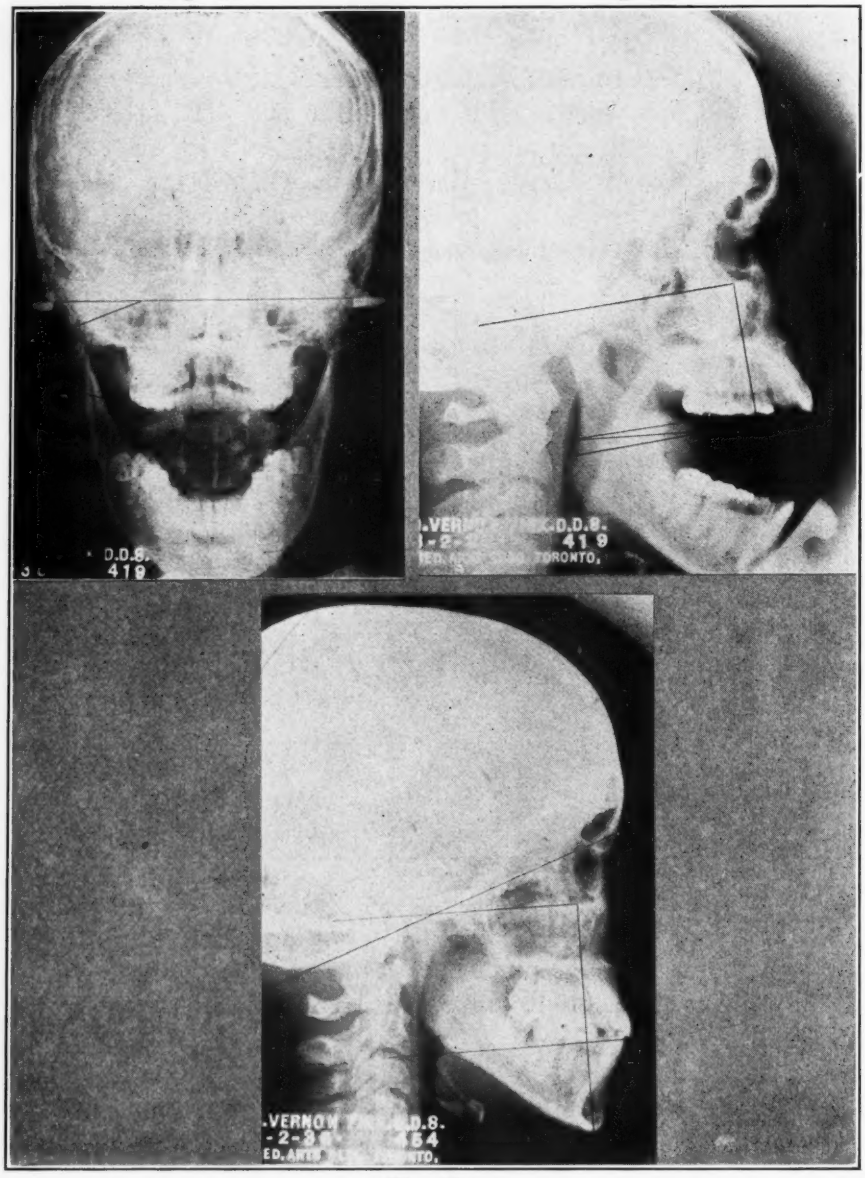

Fig. 27.

Fig. 27.—A profile roentgenogram showing Bolton-nasion, porion-orbital and left orbital planes.

Viewing a radiographic film of the normal mandibular molar region reveals the fact that the cancellations of the bone forming the upper edge of the alveolar border are of the close-meshed variety resembling compact bone. In the region of the middle third the trabeculae are further apart, the bone being wider meshed in character as the apical region is approached. The region of

the apical third may be devoid of surrounding bone except for some shadow-like lamellae which apparently support the capillaries of the nutrient canal.'' Of course the immature individual does not exhibit to the same degree this

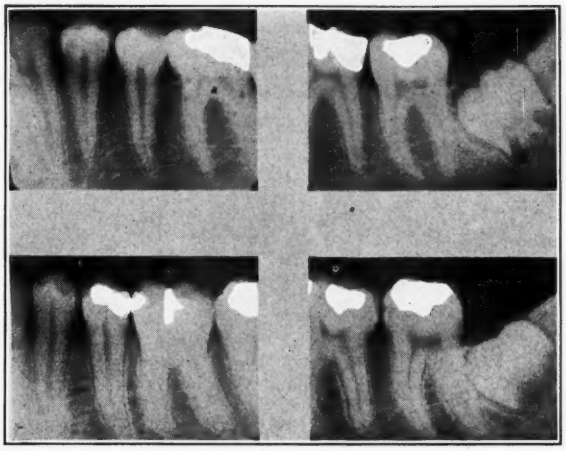

Fig. 28.—The variation in trabecular architecture of the two types of normal alveolar bone.

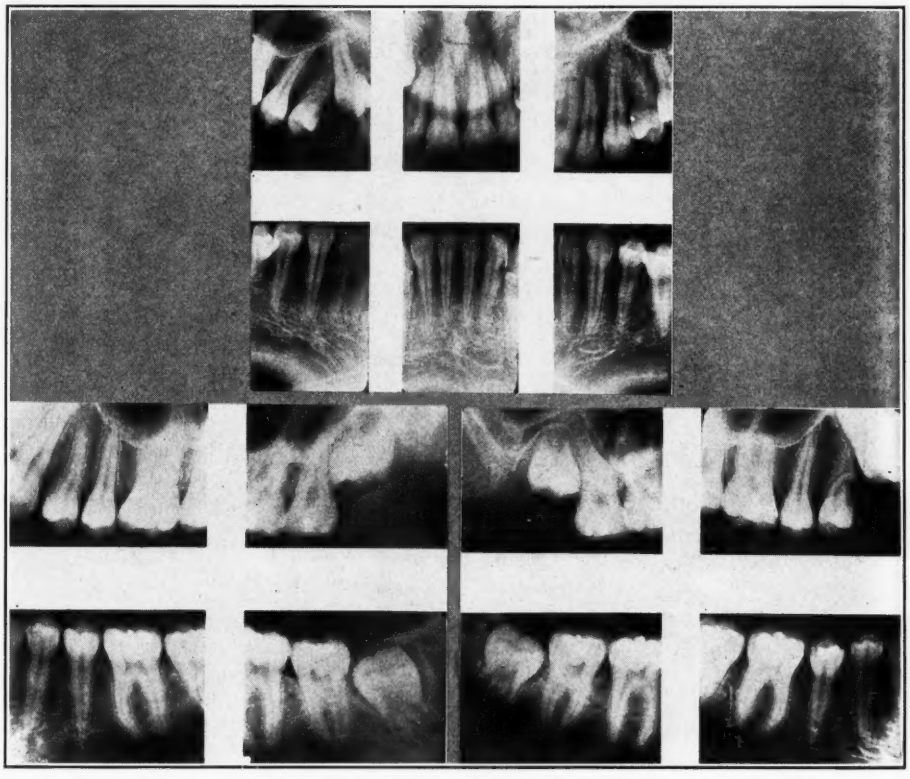

Fig. 29.—Osteoporotic alveolar bone.

characteristic picture of normal adult bone. In many areas, growth is still active. Therefore, in these areas, at least, the trabeculae are less dense, the intertrabecular spaces larger and consequently appear more radiolucent in the roentgenogram.

*Anatomic Variations.*—Examination of the intraoral roentgenograms of the normal alveoli indicates that there are two types of cancellations; one, in which the trabeculae are very fine, dense and numerous, and contrasts sharply with the second type which has sparse, knotted trabeculae. While anatomic variations may be observed in both maxilla and mandible, due to the greater uniformity in buccolingual diameter, variations are more readily demonstrated

TABLE I

EFFECT OF PHYSIOLOGIC AND PATHOLOGIC FACTORS ON CALCIUM AND PHOSPHATE METABOLISM*

| | SERUM | | | EXCRETION OF CALCIUM BY | | EXCRETION OF PHOSPHATE BY | | BONE CALCIFICATION |
|---|---|---|---|---|---|---|---|---|
| | CALCIUM | PHOSPHATE | PROTEIN | BOWEL | KIDNEY | BOWEL | KIDNEY | |
| Measures effective during growth period or when there is a preexisting disorder of phosphorus and calcium metabolism: | | | | | | | | |
| Low calcium diet | – | (+) | 0 | (–) | – | – | + | – |
| High calcium diet | + | (–) | 0 | + | + | + | – | + |
| Low phosphorus diet | (+) | – | 0 | – | + | – | – | – |
| High phosphorus diet | – | + | 0 | + | – | + | + | + |
| Acidifying measures | + | + | 0 | – | + | – | + | – |
| Alkalizing measures | (–) | (–) | 0 | + | – | + | – | – |
| Incomplete intestinal absorption of fat | (–) | | 0 | + | – | – | + | – |
| Vitamin D | + | + | 0 | – | | – | | + |
| Measures effective in all subjects: | | | | | | | | |
| Starvation | | | | – | + | – | + | – |
| Parathyroidectomy | – | + | 0 | | – | | – | + |
| Parathyroid extract | + | – | 0 | | + | | + | – |
| Hypothyroidism | (+) | | 0 | | – | | – | + |
| Hyperthyroidism | (–) | | 0 | | + | | + | – |
| Changes in pathologic conditions: | | | | | | | | |
| Malnutrition | – | | – | | | | | |
| Rickets (usual type) | (–) | – | 0 | + | | + | | – |
| Rickets (with tetany) | – | (+) | 0 | + | | + | | – |
| Osteomalacia | (–) | – | 0 | + | | + | | – |
| | – | (+) | 0 | + | | + | | – |
| Polycythemia vera | + | | 0 | | | | | |
| Nephritis (nephrotic) | – | (+) | – | | | | | |
| Nephritis (terminal) | – | + | (–) | | | | | |
| Diabetes with ketosis | (–) | (+) | (–) | | + | | + | – |
| Diabetes with malnutrition | – | | – | | | | | |
| Diarrhea | – | | (–) | + | | + | | |
| Obstructive jaundice | (–) | | 0 | + | – | – | + | (–) |

0, no effect; +, increased; –, diminished.

*Table taken from *Quantitative Clinical Chemistry* (after Peters and Van Slyke).

in the mandible. The roentgenograms of right mandibular molar and premolar areas of two males illustrate the anatomic variation of alveolar bone (Fig. 28).

Clinical evidence such as hyperemia of the soft tissues, dental caries, sensitive enamel, and root resorption may indicate disturbances in calcification. Disturbances in calcification may result in osteoporosis. An examination of the intraoral roentgenograms of such cases reveals that the alveolar medullary trabeculae are noticeably less numerous (Fig. 29). As bone is a labile tissue and only by constant resorption and deposition of new bone are the

normal volume, density and architecture maintained; osteoporotic bone is the result of resorption at a greater rate than deposition. Some of the factors which influence bone calcification are dietary deficiencies, glandular imbalance, infections, and the so-called atrophy of disuse. Table I shows the manner

Fig. 30.

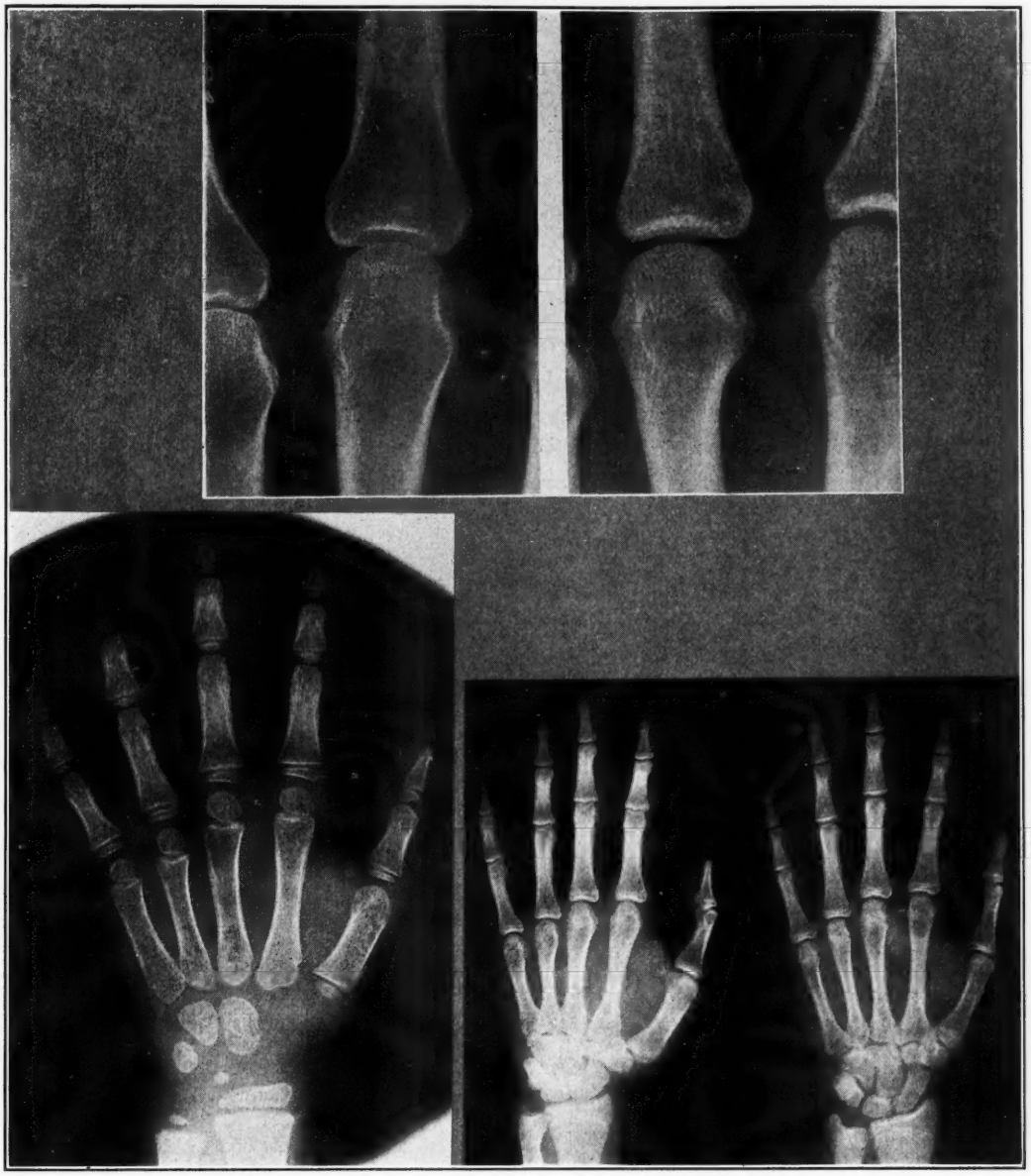

Fig. 31. Fig. 32.

Fig. 30.—The variation in trabecular architecture of normal carpal bone of two males.
Fig. 31.—Retarded carpal development in the hand of a six-and-one-half-year-old girl.
Fig. 32.—Difference in carpal development of approximately two years in the left hands of two fifteen-year-old males.

in which these various factors affect bone calcification. Because of the probable indications that such osteoporotic bone is evidence of faulty calcification and is consequently likely to have an effect upon growth of the jaws, cooperation with competent medical service is advisable before the commencement

of treatment to determine if possible the underlying cause for the osteoporosis. By means of such cooperation the orthodontist has an excellent opportunity of linking together the specialties of dentistry and medicine upon a common biologic growth problem of which the malposed teeth are only a symptom.

### CORRELATION WITH ROENTGENOGRAMS OF THE HAND

Anatomic variations in the trabecular architecture are also found throughout other skeletal structures and are readily demonstrable in the roentgenogram.

A roentgenogram of the hand shows very clearly these trabecular variations and is easily made. Todd[5] describes the trabecular architecture of the hand as follows: "In mankind there are two types of cancellous architecture, one in which the secondary trabeculae are very fine, very numerous and quite obscured. This is the 'smoky' texture and contrasts with the 'spider' texture of those bones which have coarse, sparse, knotted trabeculae. [Fig. 30.] The latter form is rarer, familial in nature and presumably hereditary. Clinically, it is often picked out as indicating healed rickets or congenital syphilis, but it is neither and has no pathological significance. It is the characteristic pattern of cancellous tissue of the anthropoid apes. It is best seen in the hand but occurs throughout the skeleton. It is not associated with fragitalis osseum."

The roentgenogram of the hand of the growing child provides other useful information. The calcium penetration of the cartilaginous matrix marks the stage of development of the individual, a reliable determination of skeletal age as Howard[6] has previously demonstrated (Fig. 31). The standards presented by Howard are helpful in estimating skeletal age. Fig. 32 illustrates the hand roentgenograms of two boys both fifteen years of age, who happened to be in my office one afternoon together. Their left hands were placed upon a loaded cassette, and an exposure was made. The difference in their chronologic age was only two months, but the difference in skeletal ages was approximately two years.

### CONDYLAR RELATIONSHIP

The remarkable adaptability of the temporomandibular articulation to the demands of various occlusal anomalies has been universally recognized. Condylar displacements and abnormalities of the temporomandibular articulation are, however, frequently associated with excessive overbites, and lateral, anterior or posterior displacements of the mandible. Though unilateral condylar displacements are often accompanied by lateral displacements of the mandible; the reverse is not always true. In the adult particularly, the mandible may have been displaced for a sufficient length of time that growth in the body of the mandible has permitted the condyle upon the side opposite the displacement to assume its normal relationship to the glenoid fossa. A diagnosis of condylar displacement based upon mandibular displacement alone may, therefore, be fallacious. If the tips of the operator's little fingers are placed in the patient's external auditory meati and the jaws closed lightly, perceptible pressure by the head of the condyle against the fingers indicates a posterior displacement of the condyles. Cases which present symptoms of

noisy, traumatic, painful, limited, or excessive condylar excursions, or even such associated symptoms as hearing disturbances, tinnitus, vertigo or speech defects, have not been completely diagnosed unless consideration has been given the condylar relationship.

Using the technic described by Riesner,[7] roentgenologic examination of the temporomandibular region on both sides with the jaws together and also

Fig. 33.

Fig. 34.

Fig. 35.

Fig. 33.—The condylar relationship of a treated case having a dual bite when the mandible is closed in the posterior position.

Fig. 34.—The same case with the teeth closed in the forward position.

Fig. 35.—The condylar relationship with the jaws in the open position.

with the jaws apart until the incisal edges of central incisors are separated 1¼ inches provides important diagnostic data for such cases. (Figs. 33, 34, and 35.)

As maximum efficiency in mastication is dependent not only upon normal occlusal relationship but upon normal condylar relationship as well, roent-

genograms of the temporomandibular articulation comprise an integral part of any complete orthodontic diagnosis of cases presenting abnormalities similar to those previously mentioned.

SUMMARY

Craniometric methods of diagnosis appear to be the most reliable yet developed.

A complete diagnosis includes not only the contour of the osseous structures supporting the teeth, their relationship to the cranium, but also the internal architecture of the bones of the jaw. Variations in the trabecular architecture of the jaws are enumerated, some of which may be anatomic, others osteoporotic.

Correlation of the alveolar with other roentgenograms of the skeletal structures, e.g., the hand, is recommended.

Finally, in certain cases condyle roentgenograms should comprise an integral part of a complete orthodontic diagnosis.

It is a pleasure to make grateful acknowledgment of my indebtedness to my associate, Dr. Andrew A. Somerville, for his helpful assistance in preparing some of the photographs used for illustrations; also to a former associate, Dr. Milton Culbert, for his cooperation in making drawings.

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# OBSCURE ETIOLOGY

GEORGE M. ANDERSON, D.D.S., BALTIMORE, MD.

CASE 1.—A minor malocclusion of the maxillary incisor teeth is shown in Fig. 1. Fig. 2 shows result after four years of treatment. Fig. 3 shows result two years later. While an even alignment of the teeth was obtained, the result

Fig. 1.

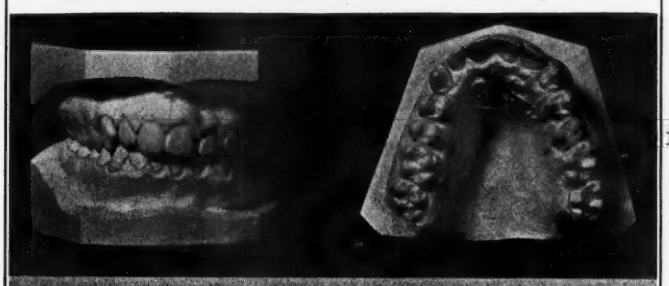

Fig. 2.

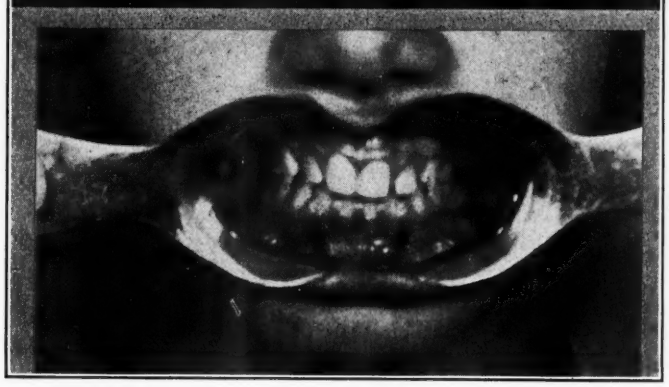

Fig. 3.

was unsatisfactory esthetically, since it was never possible to bring the development of the right side to the plane of occlusion established for the left side. Photographs (which cannot be illustrated because parent's permission could not be obtained) indicated a disharmony in facial development as the years of treatment passed. It became apparent that we were not dealing merely with a malocclusion of the teeth but a definite interference in facial

Presented at the Thirty-Fourth Annual Meeting of the American Society of Orthodontists, St. Louis, April 20-23, 1936.

development and underlying structures from causes unknown. The early years of treatment gave little or no evidence of what was to follow. An anteroposterior radiograph of the skull five years after treatment was instituted shows that there is a deficiency in development of the right side, particularly reflected in the nasal area, and it is interesting to note the relation of the floor of each nares in relation to the occlusal plane of the teeth (Fig. 4). The radiologist's report simply amplifies our own observation that

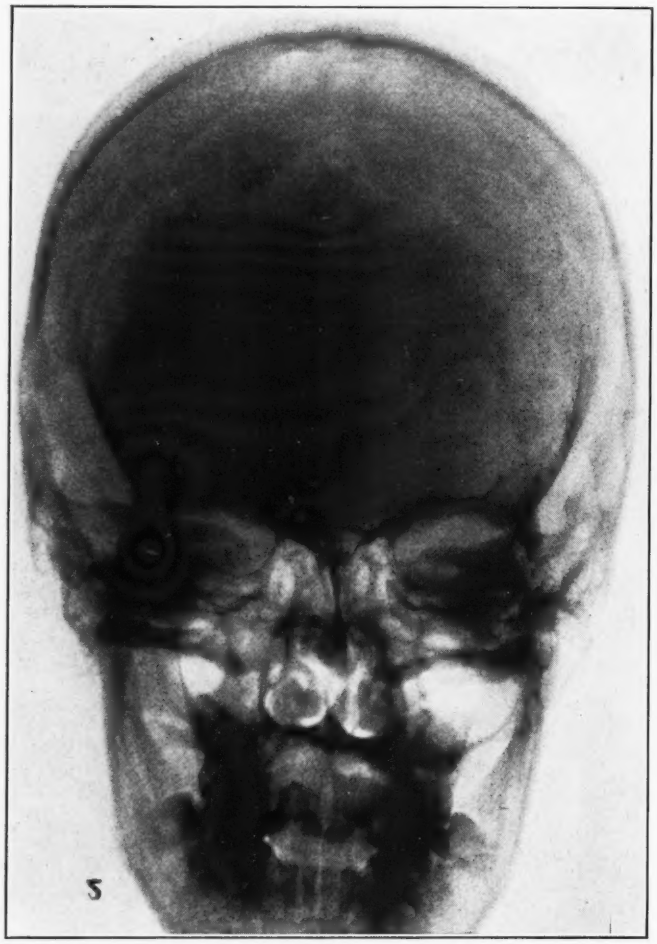

Fig. 4.

what had appeared to be a simple malocclusion was, in fact, a most complex problem. "There is a definite asymmetry in formation of the bones of the face. The bony portion of the right orbit appears to be larger than that of the left, and the right antrum is larger than the left. The nasal septum is badly deflected toward the left, and there is a prominence of the right turbinates. The left malar eminence is more prominent than the right. The frontal sinuses are trilobed, one large central frontal and one small one on either side. The superior maxilla is included in the deformity; the right half is on a slightly higher level than the left."

CASE 2.—Dual bite or loose condyle. Fig. 5, patient under treatment four years for distoclusion. While elastics were worn, result seemed all that could be desired. Relapse each time use of elastics was discontinued. Fig. 6, profilographs of dual bite, taken at same time as photographs shown in Fig. 5. Radiographs of condyle region (Figs. 7-10) indicate that it was not and is

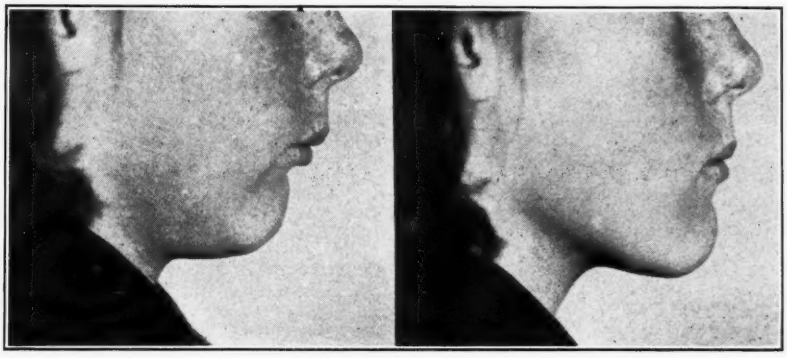

Fig. 5.

Fig. 6.

not possible to maintain a forward bite which would give normal facial outline. The correct relation of the condyle in the fossa results in the distal bite with bad facial outline. The radiologist's report is as follows: "When the patient draws the mandible backward, the condyle fails to leave the fossa with the mouth open, which is abnormal; in other words, where normally the condyle rests below the eminence in front of the glenoid fossa, the patient has

Fig. 7. Fig. 8.

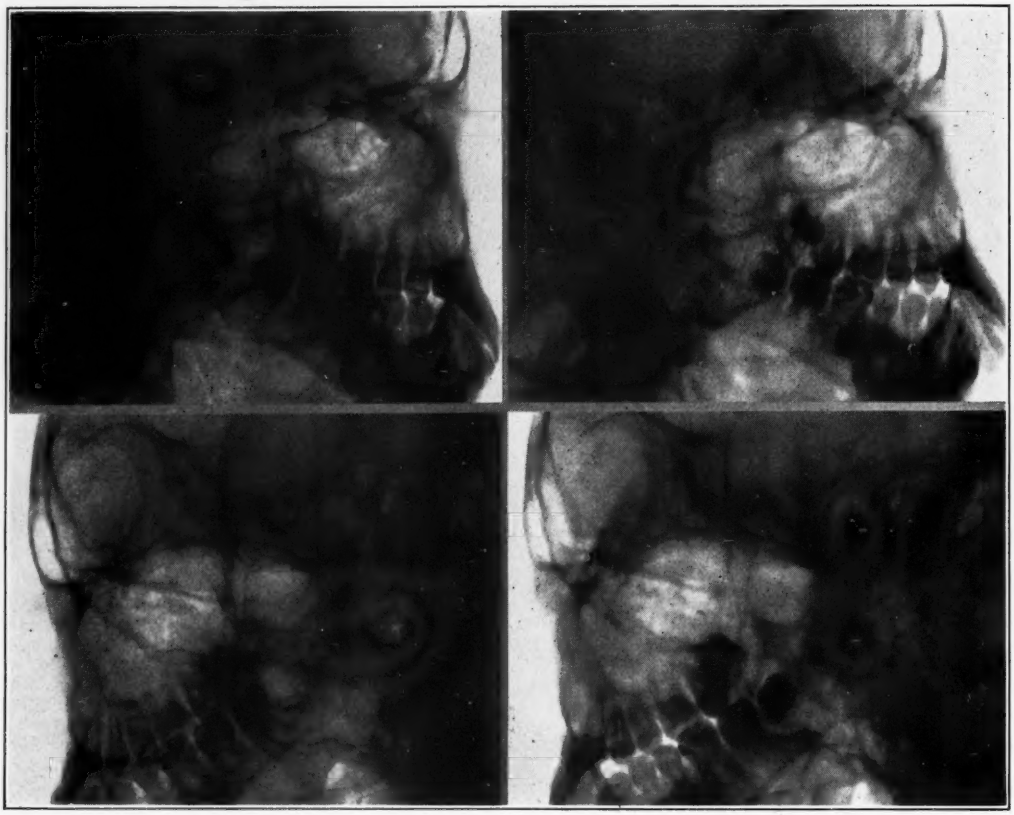

Fig. 9. Fig. 10.

Fig. 7.—Left condyle. Mandible forward, teeth closed.
Fig. 8.—Left condyle. Mandible back, teeth closed.
Fig. 9.—Right condyle. Mandible forward, teeth closed.
Fig. 10.—Right condyle. Mandible back, teeth closed.

the ability to draw the condyle back into the fossa with the mouth open. This may be due either to the development of the condyle, relaxation of the soft

Fig. 11. Fig. 13.

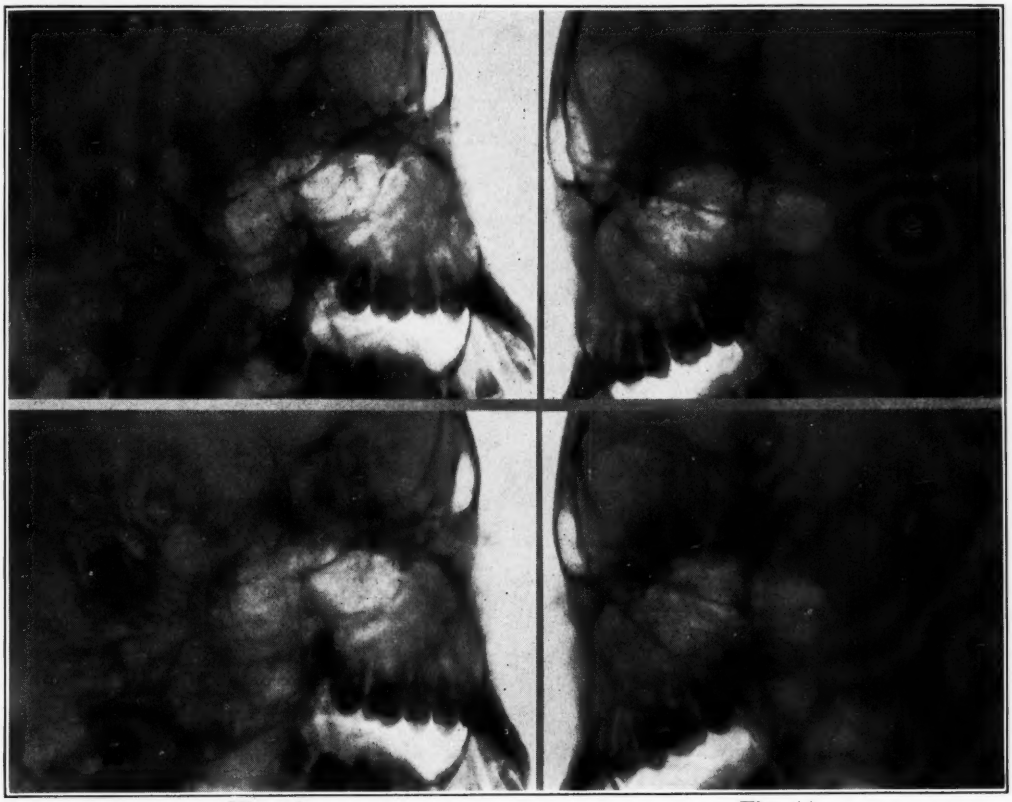

Fig. 12. Fig. 14.

Fig. 11.—Left condyle. Mandible back, teeth open.
Fig. 12.—Left condyle. Mandible forward, teeth open.
Fig. 13.—Right condyle. Mandible back, teeth open.
Fig. 14.—Right condyle. Mandible forward, teeth open.

structures or unusual muscle development.'' Figs. 11-14 further indicate the position of the condyle when the mouth is wide open.

# CASE OF HEMIACROMEGALY

## Showing Eruption of Maxillary Right Permanent Canine and Mandibular Right First Premolar at Four and One-Half Years of Age

E. B. Arnold, D.D.S., Houston, Texas

THE patient, a boy: *Age,* five years. *Height,* three feet seven inches. *Weight,* forty pounds.

*Feeding.*—Natural feeding during infancy. Has always had a good appetite, and has been able to eat everything. Eats plenty of fruits and vegetables. Average normal diet.

*Diseases.*—Measles at age three years. No other illness except sometimes light fevers with colds. Adenoids and tonsils have never been examined nor removed; however mother advises that they have never given the child any trouble.

*Habits.*—Breathes through mouth sometimes at night, otherwise no abnormal habits.

*Mentality.*—Year 1934, age five years, apparently normal. Year 1936, age seven years, mother reports the child makes exceptionally high grades at school.

*Parents.*—Apparently normal teeth. Mother reports that child's uncle on maternal side had a similar enlarged right cheek, and she thought his teeth were normal. Was unable to check this information as the uncle is living out of the state.

Fig. 1 shows photographs at age five years. The picture on the left shows an anterior view of the teeth occluded. Note the erupted maxillary right canine as well as the complete buccal occlusion of the maxillary teeth to the mandibular teeth on this side. The picture on the right shows the right side with the bite opened. This also shows eruption of the maxillary right permanent canine and the mandibular right first premolar. Note the peculiar papillae of the tongue on this side which seems to be hypertrophied or abnormally large papillae. While the patient was five years old at that time, his mother stated that above mentioned permanent teeth had been in since he was four and one-half years old.

Fig. 2, on the left is a model of the teeth at five years of age, made in April, 1934. It shows occlusal views of the maxillary right permanent canine and the mandibular right first premolar. The model on the right was made just two months later, during which time the mandibular right deciduous canine had been lost and the mandibular right permanent central incisor and canine had begun to erupt.

Presented before the Thirty-Fourth Annual Meeting of the American Society of Orthodontists at St. Louis, April 22, 1936.

Fig. 1.

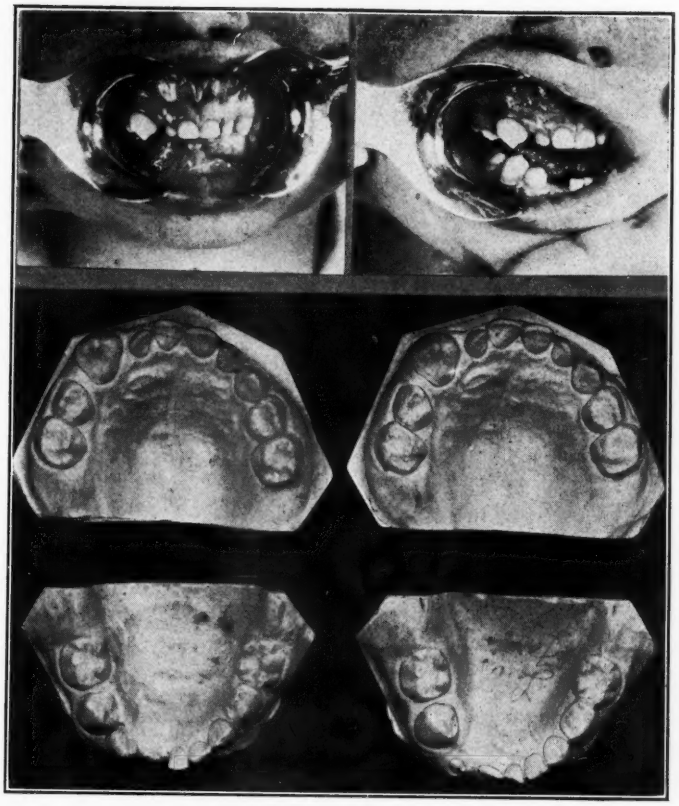

Fig. 2.

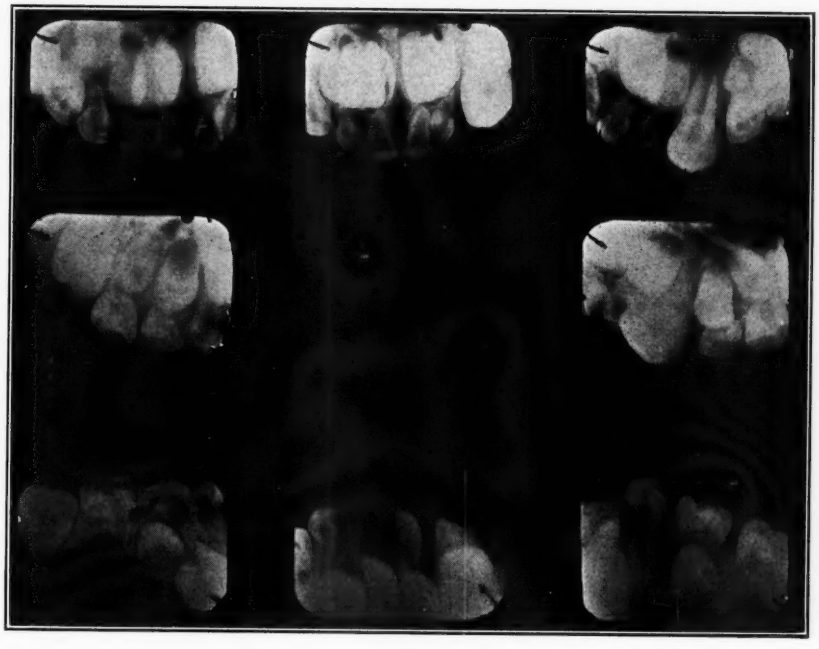

Fig. 3.

Fig. 3 shows intraoral radiograms taken June, 1934, at five years of age. Between the maxillary permanent central incisors there is a supernumerary tooth that seems to be inverted. The upper right picture shows definitely the erupted maxillary right permanent canine. Note that the lower right picture shows the mandibular right first premolar erupted, the root of

Fig. 4.

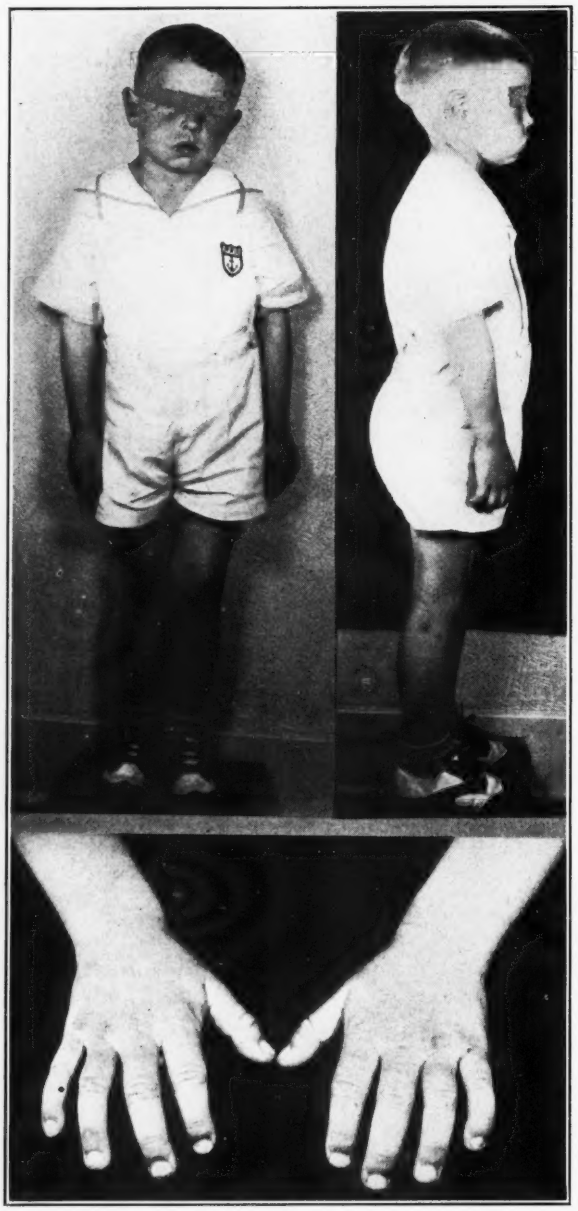

Fig. 5.

which is almost completely developed. Contrast this with the mandibular left first premolar of which the crown has not yet completely developed, and there is no root development whatever. Also, contrast the mandibular right second premolar, of which the crown is completely developed as well as part of the root, with the maxillary left second premolar, of which the crown is just beginning to form; in fact, the enamel is just being laid down. Note

the lower center picture which shows the left deciduous central and lateral incisors still in position, while the right permanent central incisor is erupting.

Fig. 4 shows full length photographs of the patient, taken April, 1934, age five years. Fig. 5 is a photograph of his hands. They are rather short and stubby.

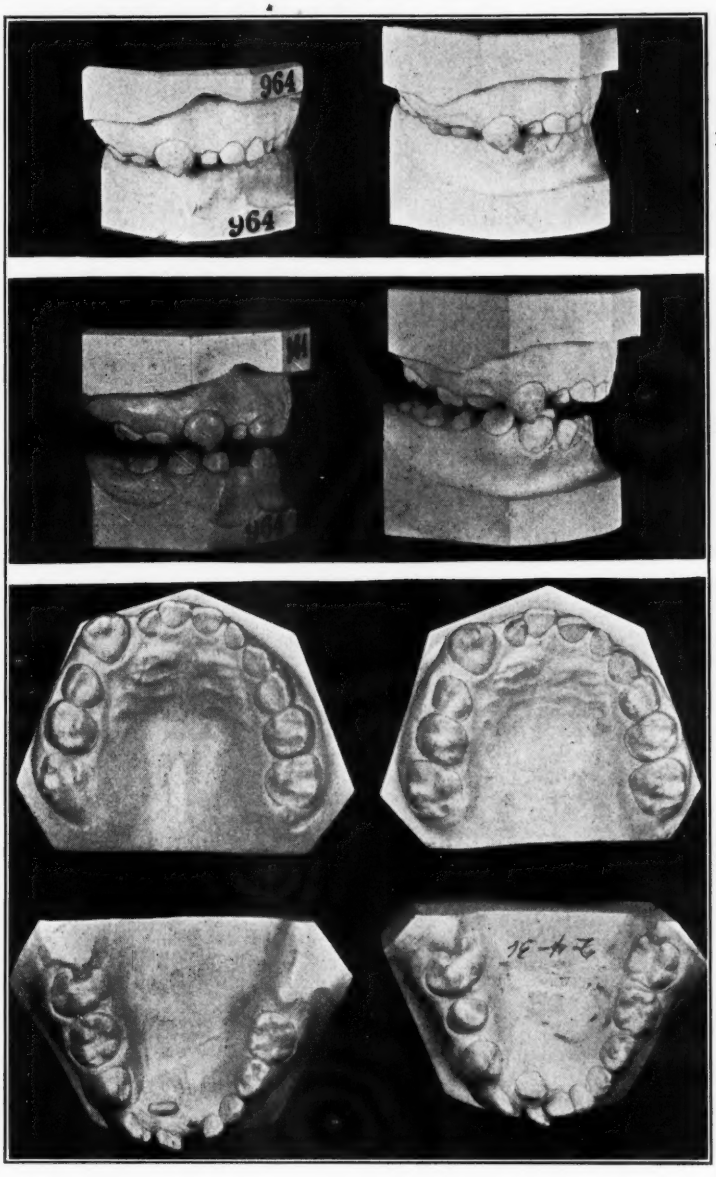


Fig. 6.

Fig. 7.

Fig. 8.

Fig. 6 shows occluded models of the case at age five years and at age seven years. Fig. 7 shows the same models as in Fig. 6, held slightly open in order to show the mandibular teeth more clearly. Note that the only permanent teeth present in the model on the left, taken at five years of age, are the maxillary right permanent canine and the mandibular right first premolar. The model on the right taken two years later, age seven years, shows the

maxillary canine and the first permanent molars, and the mandibular left and right permanent central incisors, the right permanent lateral incisor, the right

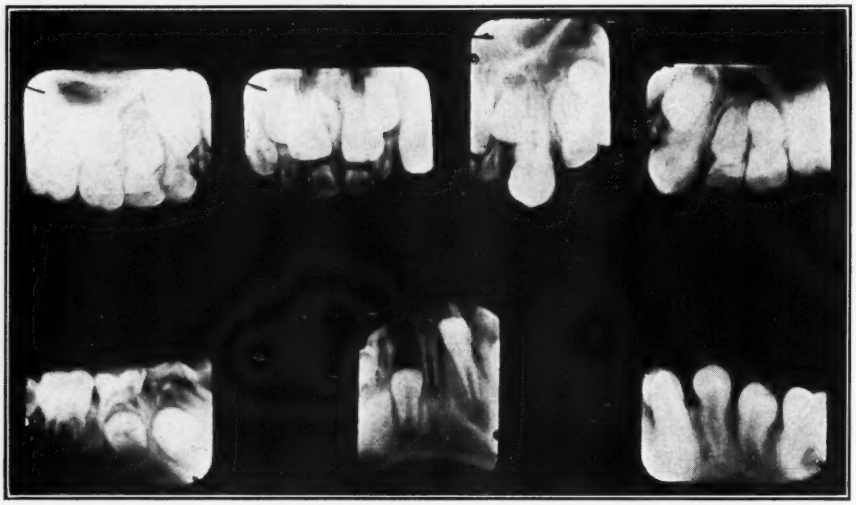

Fig. 9.

Fig. 10.

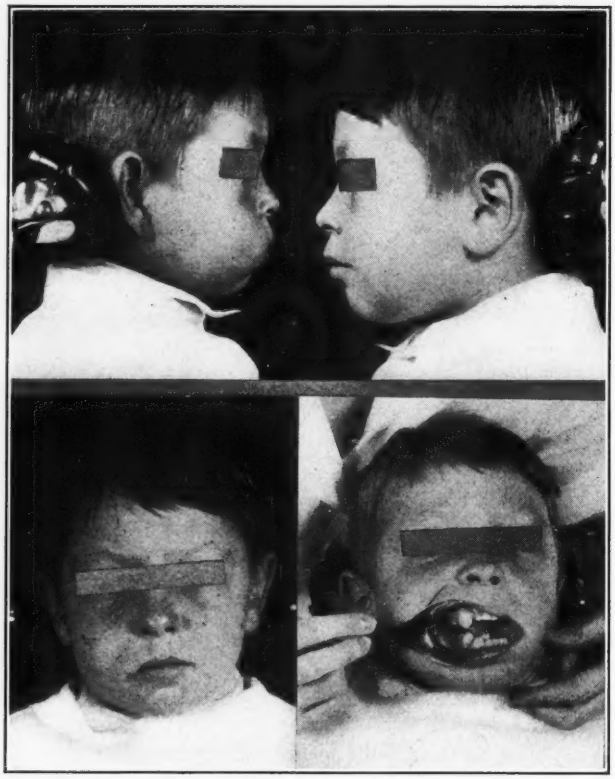

Fig. 11.

permanent canine, the right first and second premolars, and the right first permanent molar erupted. Fig. 8 shows occlusal views. One on the left taken April, 1935, age six years; and the other, February, 1936, age seven years.

Fig. 9 shows radiograms at age seven years taken February, 1936. In the maxillary arch only the right permanent canine and the right and left first permanent molars have erupted, while in the mandibular arch the right and left permanent central incisors, right lateral incisor, canine, first and second premolars, and right and left first permanent molars have erupted. The most unusual anomaly of the case is the extreme premature eruption of only the permanent right canine in the maxillary arch, as both the maxillary right and left premolars and the incisors seem to be normal; while in the mandibular arch the permanent canine and the first and second premolars on the right side are erupted and developed quite prematurely. Fig. 10 shows right and left profile views and Fig. 11 shows anterior views of the boy taken February, 1936, age seven years. Note the swollen appearance of the right side of the face in the photograph on the left, which has been characteristic during the past two years that I have been observing the case.

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## DISTOCLUSION

H. T. Berkey, D.D.S., Fort Wayne, Ind.

THE following report is of a girl aged fourteen years. Patient reported as having had whooping cough at seven and measles at eight years of age, also frequent colds, but never exhibited hypertrophy of adenoid or tonsil tissue. There was a history of tuberculosis in father's family. This factor later very much delayed treatment. The girl had been bottle fed. She was a normal breather. Oral examination showed no cavities in either maxillary or mandibular teeth. Etiologic factors were too long retention of maxillary canines and maxillary second deciduous molars, bringing about malrelation of the arches. Fig. 1 shows radiograms of these areas.

The photographs shown in Fig. 2 were taken at the time of the first visit. Impressions were taken from which casts of the denture were constructed. Fig. 3 shows occluded models, anterior view, also left and right lateral views, before and after treatment to time of retention period.

After studying the casts the malocclusion was classified as a distoclusion with linguoversion of the maxillary central incisors, also mandibular premolars on right and left side. Deep overbite. There was no occlusion except the first permanent molars and the second mandibular premolars with the lingual cusps of the maxillary deciduous second molar.

The patient was referred for extractions of the deciduous maxillary canines and second molars.

Plain molar bands with half round lingual tubes and 0.040 buccal tubes were placed on the four first molars. Removable lingual appliances with

Case reported before the American Society of Orthodontists, St. Louis, April 20-23, 1936.

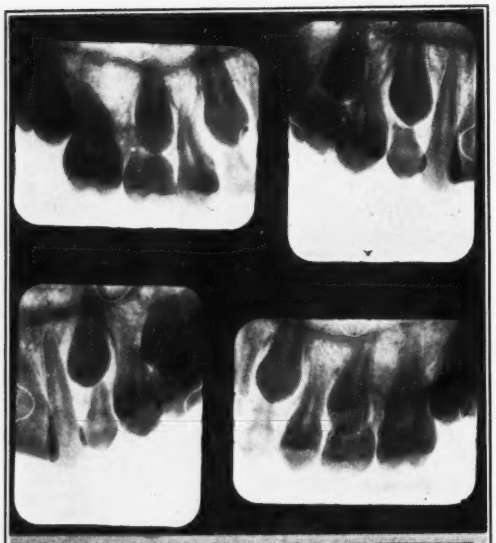

Fig. 1.

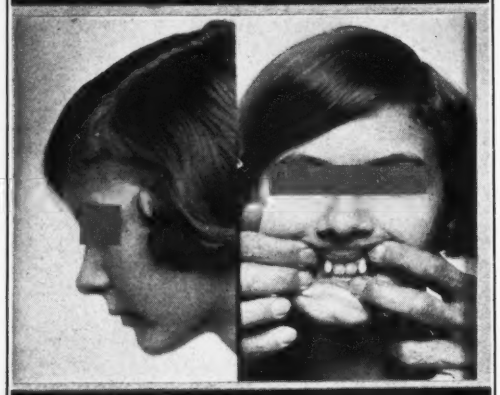

Fig. 2.

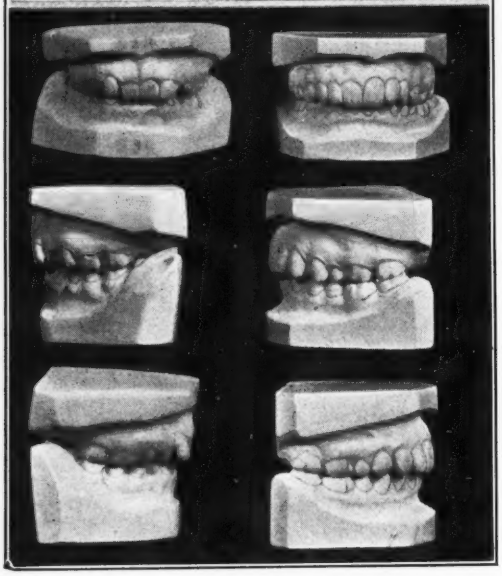

Fig. 3.

0.040 base wire and 0.020 auxiliary springs were placed in maxillary and mandibular arches. A labial arch with hooks for intermaxillary elastics was also placed on the maxillary teeth. Anterior bands with Ketcham hooks were cemented to the maxillary central incisors. After eleven and one-half months' treatment a Hawley retainer was placed on the maxillary teeth with plain bands and soldered lingual arch on the mandibular teeth for retention.

Two months after retention was started, the patient was advised to discontinue school work, and a complete rest was ordered by her physician be-

Fig. 4.

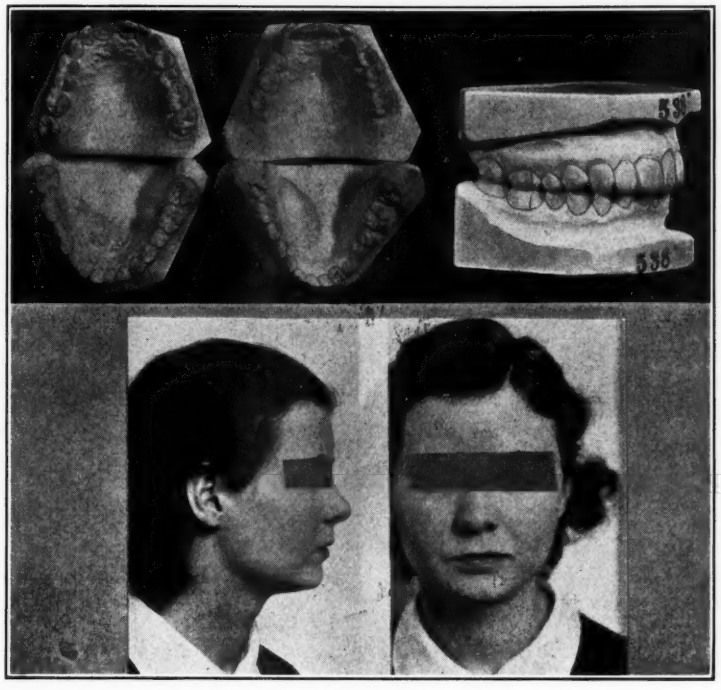

Fig. 5.

cause of pulmonary complications. After consultation with the physician, it was decided to discontinue all treatment of the teeth until her physical condition would improve. After six months' rest, treatment was resumed and the case completed.

Fig. 4 shows casts before and after completion. Fig. 5 shows photographs of the completed case.

The prognosis is favorable to the extent that a normal functional anatomical relationship will be maintained, though not ideal.

# ROOT RESORPTION CAUSED BY ECTOPIC ERUPTION OF MAXILLARY CUSPID

H. J. Buchner, D.D.S., Oak Park, Ill.

FOR some time, certain writers have been pointing out the significance of ectopic tooth eruptions, the damage caused by them, and the advisability of observing such conditions early and instituting preventive measures. The following case report is given as an example of such eruptions and as an illustration of some of the problems involved in treatment.

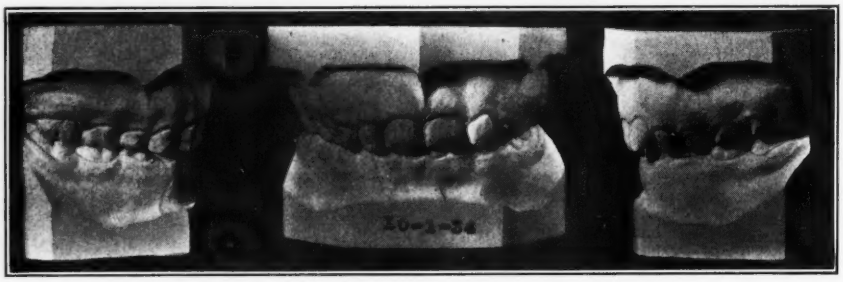

Fig. 1.

Fig. 2.

The patient was a girl aged nine years. The parent was somewhat alarmed about the slight labioversion of the maxillary right lateral incisor. There was also an excessive overbite in the incisor region and a distoclusion on the right side (Fig. 1). The tonsils and adenoids had not been removed, and respiration was normal. Birth and infancy had been normal. The child had a habit of biting the nails. Her general health was good. She had had measles at seven years and chickenpox at nine years. The pulp had been

Presented at the Thirty-Fourth Annual Meeting of the American Society of Orthodontists, St. Louis, April 20-23, 1936.

killed in the mandibular right central incisor as the result of a blow in August, 1934. A root canal filling had been placed with satisfactory results. An x-ray examination (Fig. 2) showed the maxillary first bicuspids and cuspids erupting in a forward position, the cuspids being over the lateral in-

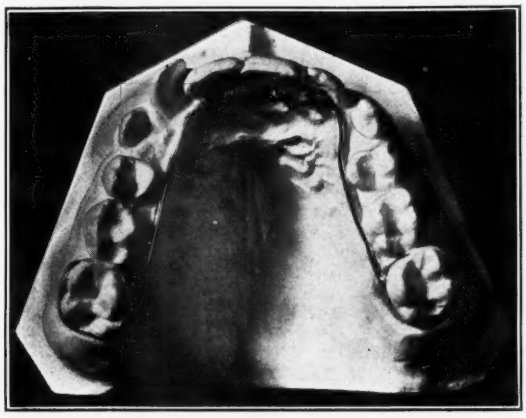

Fig. 3.

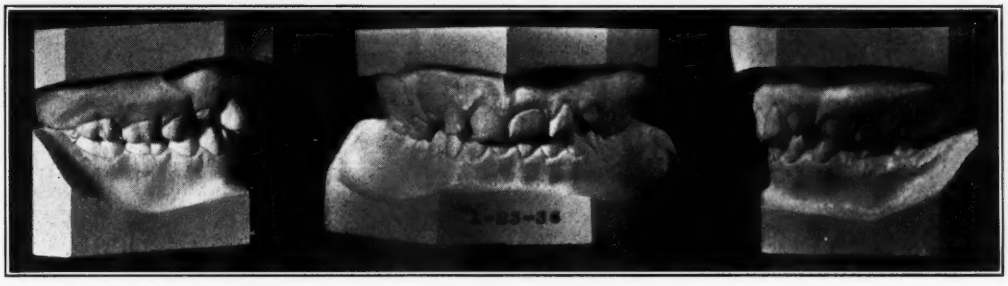

Fig. 4.

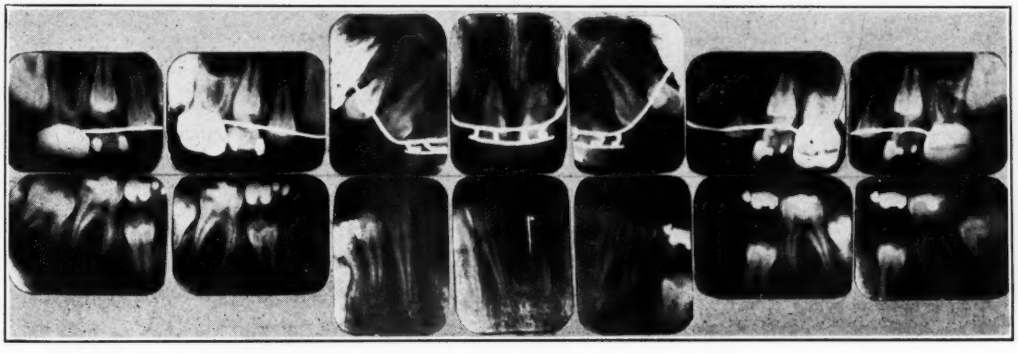

Fig. 5.

cisors. The lateral root was normal on the side where the crown was protruded. On the opposite side, however, with the tooth in good alignment, the root was extensively resorbed.

*Etiology.*—The cause of the distoclusion and disturbance in the overbite is obscure. The labioversion of the one lateral incisor and the resorption of the other have been caused by the ectopic eruption of the maxillary cuspids.

*Treatment.*—A maxillary lingual appliance with a bite plane in the incisor region and soldered attachment to the bands on the first permanent molars was placed November 1, 1934, to bring about some vertical development and change the distoclusion (Fig. 3). The maxillary deciduous cuspids and first deciduous molars were extracted to allow a backward movement of the first bicuspids and permanent cuspids. The appliance is still being worn—as a retainer.

The relationship of the teeth has been corrected (Fig. 4). The maxillary teeth have erupted in their proper positions. The maxillary right lateral incisor, which was in correct alignment, has resorbed completely (Fig. 5).

A desirable tooth movement has been accomplished in this case. However, the resorption and certain loss of the maxillary right lateral incisor are the result of the ectopic eruption and pressure of the maxillary cuspid and not preventable when observed at such a late stage of development.

# PROGRESS OF TREATMENT

A. B. Thompson, D.D.S., Des Moines, Iowa

THE cases shown here are not necessarily entirely completed. Some are under observation, others have retaining appliances still in place, and some are still under active treatment.

Case 1.—The models on the left in Fig. 1 show the result of a lip habit which had progressed to such an extent that the lower lip constantly rested

Fig. 1.

Fig. 2.

behind the maxillary incisors. This patient was a boy thirteen years of age and very sensitive in regard to his appearance; so he was willing to cooperate in every way possible.

A mandibular lingual appliance and a maxillary labial appliance, with lingual extensions in the bicuspid regions, were used. After twelve months' treatment the models on the right in Fig. 1 show the improvement, lips functioning normally.

Clinic presented at the Thirty-Fourth Annual Meeting of the American Society of Orthodontists, St. Louis, Mo., April 20-23, 1936.

Case 2.—A girl, twelve years of age, whose deciduous teeth had not been removed at the proper time, models shown on the left in Fig. 2. The same type of appliance was used here as in the first case; a plain labial arch above and a lingual appliance below, anterior bands being added later, as thought necessary. A general expansion treatment was inaugurated, with the results shown in the models on the right.

Case 3.—The casts on the left in Fig. 3 are of a patient five and one-half years of age. This, as can be readily seen, is a bad distoclusion case, which I believe would have progressed to a point which would have been almost impossible to correct if early treatment had not been started. Molar bands were fitted to the maxillary deciduous second molars, with heavy lingual extensions extending forward on each side, engaging the deciduous canines and first deciduous molars. A 0.040 labial arch was fitted to tubes on the buccal of the molar bands. The mandibular appliance was a simple lingual arch

Fig. 3

wire with finger springs. Anchor bands were also used on the mandibular deciduous second molars, with half round tubes to receive the lingual appliance. With these appliances the maxillary and mandibular arches were expanded to somewhere near the arch form of a normal child of this age.

After the arches were somewhere near normal width, which was about the beginning of the second year of treatment, intermaxillary elastics were worn, appliances being changed from time to time as the case demanded. This case has not been under active treatment continuously, since the first appliances were placed in March, 1931, but has been under supervision for approximately five years.

Casts shown on the right in Fig. 3 were made in February, 1936. The patient is still wearing a maxillary and a mandibular lingual appliance, and it probably will be necessary for intermaxillary elastics to be worn on the right side for a short time to complete the mesiodistal relation of the teeth on that side.

CASE 4.—The casts on the left in Fig. 4 are those of a young lady seventeen years of age, with both mandibular canines congenitally missing, which caused the mandibular arch to be much smaller than the maxillary, and the mandibular first bicuspids were in linguoversion, the first permanent molars being in normal relations. After studying the profile of the patient, I decided that it was necessary to expand both maxillary and mandibular arches in order to secure a more pleasing profile, as the chin was very much underdeveloped and presented a bad appearance.

Fig. 4.

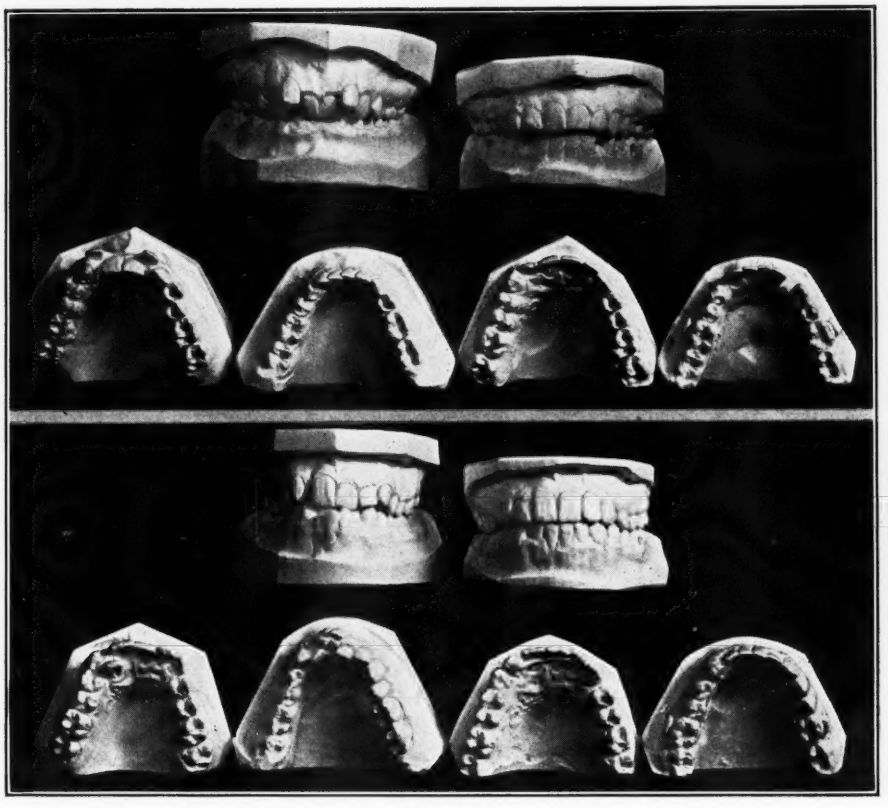

Fig. 5.

Plain labial arch wires were used, both above and below, to gain sufficient expansion to make room for the maxillary lateral incisors, and also to create normal spaces below for the missing canines. The casts on the right in Fig. 4 show the condition at this time, but the missing canines had not been artificially restored when the impression was taken.

CASE 5.—The casts on the left in Fig. 5 show a case with an extreme bunching of the mandibular incisors, resulting from the occlusion of the right maxillary central incisor in linguoversion to the left mandibular central incisor; the mandibular incisor was being forced labially out of its bony support, and there was considerable bone absorption at the gingival of the mandibular incisor.

Plain labial arch wires were used above and below, and the arches expanded to the normal size as shown in the models on the right in Fig. 4. After the mandibular left central incisor was depressed and normal occlusion with the maxillary central incisor established, bone began to fill in around the gingival of the mandibular incisor; and the soft tissue, which was badly hypertrophied, has become normal and still shows improvement each time the patient returns for inspection.

# PRACTICAL APPLICATION OF DR. MILO HELLMAN'S RESEARCH ON THE GROWTH OF THE FACE AND THE DEVELOPMENT OF THE DENTITION

M. A. Munblatt, D.D.S., New York, N. Y.

THE value of any orthodontic research may be measured by the extent to which it can be practically applied in the treatment of the cases which confront the orthodontist. Dr. Hellman's reports have been recognized and accepted as important scientific contributions to the profession, but the practical application of the principles evolved is not clearly understood. The purpose of this clinic is to demonstrate the manner in which varied cases of malocclusion are treated on the basis of the knowledge gained from Hellman's researches.

The relationship of the growth of the face to the development of the dentition has been clearly shown by Hellman in his various reports.[1, 2, 3] In regard to the question of the onset of malocclusion and its final development in the child, the evidence points to the fact that occlusion, whether it be normal or abnormal, is not a fixed condition in the growing child. Any attempt to tinker with the teeth by the insertion of an appliance during the early stages of growth and natural development of the occlusion is risky and very often interferes with normal dental development.

In the various cases demonstrated, the beginning of treatment was timed in each case, wherever possible, so that mechanical interference might accomplish a definite beneficial result and at the same time do the least amount of harm. Recognition must be made of the fact that any appliance under the most competent and skillful direction is liable to do harm. The microscopic evidence of the recent work of Oppenheim[4] on the tissue changes as a result of orthodontic treatment cannot be denied; and the clinical evidence as well as the macroscopic roentgenographic material being accumulated and studied,[5] substantiates the fact that orthodontic tooth movement has some traumatic effects. Delicate, simple and controlled manipulation of the appliance must be exercised to minimize the damage and to avoid permanent injury.

While the various principles were touched upon during the presentation, the main object of the clinic is to demonstrate the purpose of the orthodontic appliance and the degree of simplicity possible in its construction in order to attain any type of tooth movement and occlusal change necessary in the treatment of the malocclusion present. Angle's original requirements, namely, (1) simplicity, (2) efficiency, (3) delicateness and (4) inconspicuousness, are adhered to as much as possible. The results attained in the different types of cases demonstrated prove the efficiency of the appliance.

Clinic presented at the annual meeting of the American Society of Orthodontists, St. Louis, April 22, 1936.

The appliance, however, is only an instrument with which tooth movement is attained. The mere construction and insertion of the appliance mean very little unless the principles involved and the technic for the manipulation of the appliance are learned. Successful treatment of any case of malocclusion implies not only a proper timing of the beginning of mechanical interference but also a proper timing of the various technical steps involved. The sooner we realize that the construction of the appliance, important as it is, is only a small part of the knowledge necessary for successful orthodontic treatment, the greater progress will the profession of orthodontia make. The educational system of the past, although it has earnestly endeavored to broaden the knowledge of the orthodontic student, has placed too much emphasis on the appliance. Various types of appliances were taught, but not enough consideration was given to the fact that an appliance must be used and tested through the various stages of treatment before it can be considered efficient.

The knowledge, skill and training necessary for the proper treatment of any case of malocclusion are such as to require any individual to be kept under competent supervision for an extensive period. For this reason, short intensive instruction of the beginner in orthodontic technic is the greatest obstruction to orthodontic progress, and the frequent changing by an experienced orthodontist from one appliance to another without proper training in construction, insertion and use under proper supervision of one who has definitely proved the efficient and successful use of the appliance, leads to greater confusion.

A lack of understanding of this principle makes the orthodontist an easy prey to any new type of appliance which has not been properly tested even by the sponsor, and very often is presented by an individual who is not even an orthodontist. We must definitely recognize the fact that orthodontic practice requires scientific knowledge and technical skill and training. The less we depend on new types of attachments and so-called improved modern appliances, the better will we understand the real problems involved.

The proper relationship between facial growth, anthropometric measurements and treatment of malocclusion is in a state of confusion. The anthropometric studies of Hellman have enabled him to develop certain principles, but the technical problems involved in treatment have nothing to do with anthropology. As a matter of fact, the studies of Hellman show a negative relationship between facial growth and orthodontic treatment. We cannot change natural growth in treatment, but we can take advantage of growth in our procedures. The real value of these anthropologic studies is found in its application to the general problem of orthodontia. Anthropometric measurements are especially helpful in determining the need for treatment and the best time for its institution in the individual case involved. Incomplete knowledge of growth and its faulty application to our technic only confuse the entire issue.

For the purpose of illustrating this report, one case of the different types shown at the clinic is presented for publication. Figs. 1 and 2 show the case before and after treatment. It is a Class I type of malocclusion, with a deep

bite and a pronounced overjet. The mandibular arch is in complete collapse and the mandibular molars on both sides occlude lingually to the maxillary molars. Whether this case is considered by some difficult or simple is beside the point, but it is ideal for the purpose of illustration, because it requires varied types of tooth movement and occlusal changes.

Fig. 1.

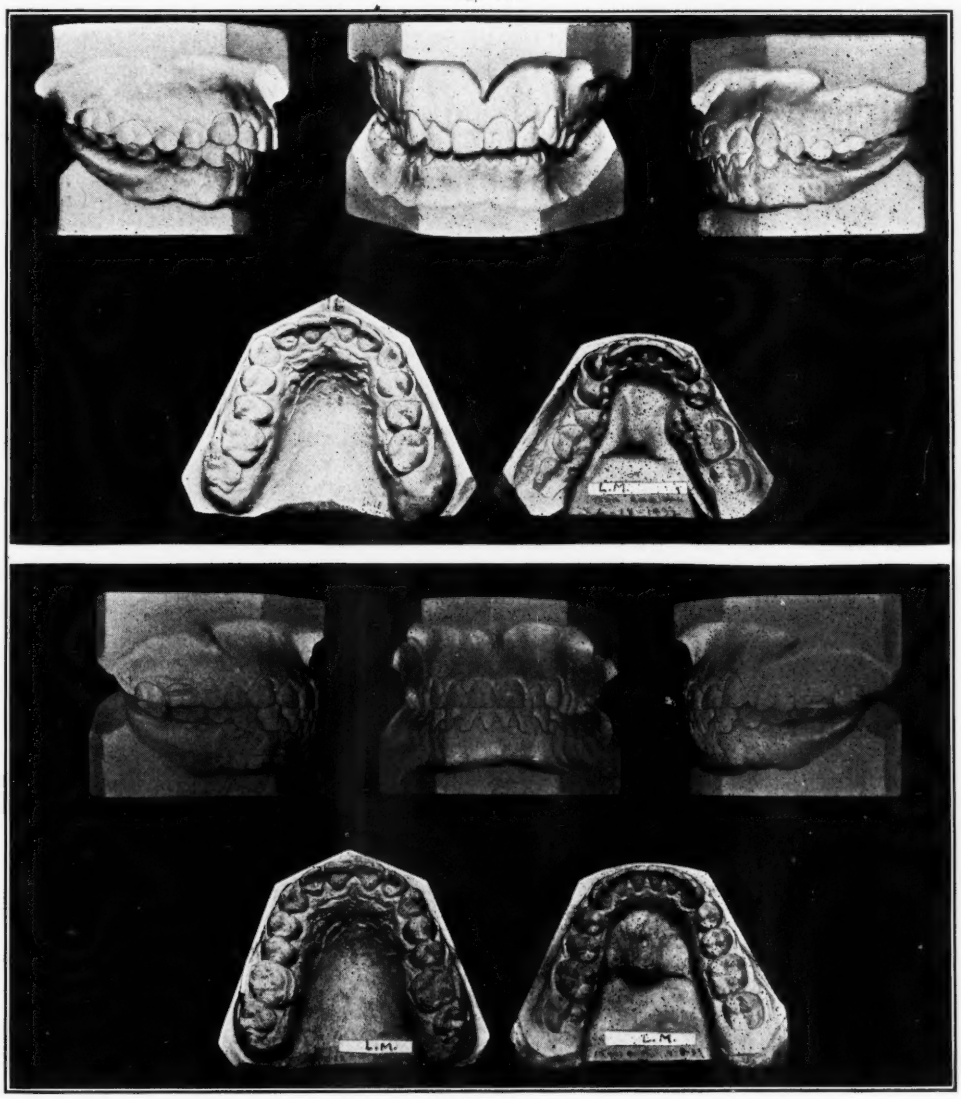


Fig. 2.

Fig. 1.—Casts of the dentition of a boy thirteen years, nine months old, showing Class I malocclusion before treatment.

Fig. 2.—Casts of the dentition one year and three months later, showing condition after treatment, but still under retention.

A bite plate (Fig. 3) was used to open the bite. Spurs were soldered on the lingual surfaces of the maxillary molar bands to fit into slots cut into the molar area of the bite plate. The purpose of this is to hold the plate in place.

The molar bands are made of coin gold band material. The indirect method is used in their construction. In making the band, it is slit at dif-

ferent points, overlapped and soldered with 22K solder to fit the contour of the tooth properly. These bands are recemented every six months and are used throughout the treatment. Labial appliances (Fig. 4) of 0.036 gauge platinum iridium wire are used for the maxillary and mandibular arches in conjunction with wire ligatures. When active treatment is completed, a mandibular lingual retainer is constructed, at which time the buccal tubes of the mandibular molar bands are removed and replaced by hooks for intermaxillary elastics. The lingual retainer fits into small horizontal tubes on the lingual side of the mandibular molar bands. Spurs from the bands on the mandibular cuspids fit into slots on the retainer.

Fig. 3.

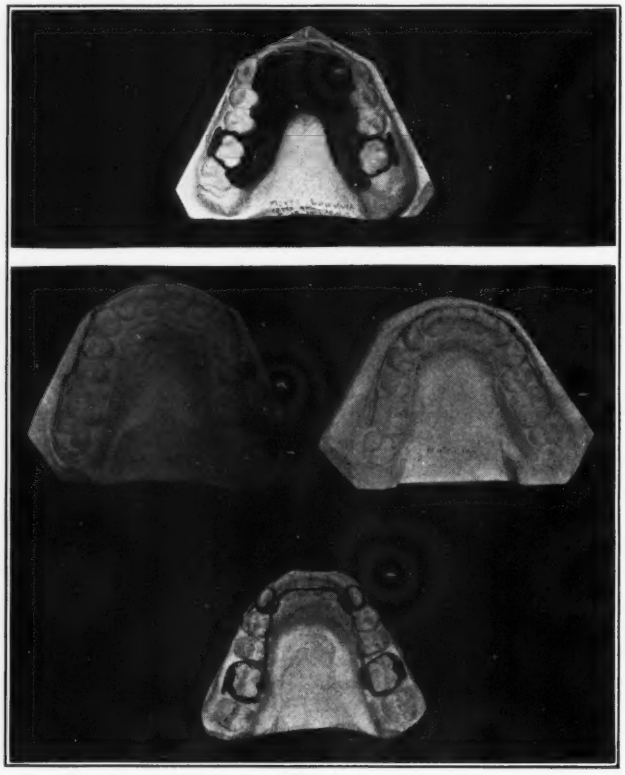

Fig. 4.

Fig. 3.—Cast of maxillary arch, showing bite plate used at the beginning of treatment, molar bands in place. Slots in molar area of plate visible.

Fig. 4.—Casts with appliances used during treatment and retention: maxillary labial appliance; mandibular labial appliance; mandibular lingual retainer, buccal tubes of molar bands replaced by hooks for intermaxillary elastics.

During active treatment the patient is seen once a week, and each arch is removed alternately every two weeks. A prophylaxis is performed, the arch is adjusted and re-ligated with the wire ligatures. Intermaxillary elastics were used at different intervals in this case, according to the required needs. During the period of retention the maxillary arch was used at night only, with intermaxillary elastics. The time of active treatment was about one year, and retention took another year.

The technic for the construction of the appliance used has been developed by Dr. Hellman over a period of years. Although it is kept as simple

as possible, its construction and use are planned so as to fit properly, cause the least amount of irritation to the tissues and allow for the greatest amount of control in its action. Every step in the construction of the appliance is made with plans for possible use during treatment. Spurs, extensions, etc., although very simple, must be properly placed and adjusted, and they have a definite purpose. The use of this appliance requires the development of a technical skill so necessary for successful orthodontic treatment.

Some cases which were kept under observation were also shown during the presentation of the clinic, and they will be published at a future date. Various problems of treatment were analyzed in the light of the scientific evidence we now possess. The future welfare of the orthodontist lies in the correct interpretation of this evidence and a proper training in the practical application of the principles evolved.

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57 WEST 57TH STREET

# SILVER NITRATE AS A PROTECTION AGAINST CARIES BENEATH ANCHOR BANDS

FREDERIC T. MURLLESS, JR., D.D.S., F.A.C.D., HARTFORD, CONN.

THE use of silver nitrate as a means of abating dental caries dates back at least to 1846, when references to it are found. Though used sporadically in aqueous and alcoholic solutions of various strengths, and in the form of fused crystals, its protective value as an inhibitor of caries was not generally recognized until Dr. Percy Howe of the Forsyth Clinic introduced its use in the ammoniacal form about 1917. Previous to that time I had used silver nitrate in crystals and in solutions as a protective treatment for anchor teeth beneath orthodontic molar bands, but the ammoniacal form of silver nitrate for this purpose was adopted soon after its introduction by Dr. Howe, and it has since then continued to be used habitually as a prophylactic against caries in an orthodontic practice.

The silver nitrate solution employed is about 40 per cent. By ammoniation, the nitric acid is made inactive, and there is no chemical attack upon the lime salts of the tooth, and further disorganization of the mineral structure is avoided. Eugenol is preferable to a solution of formaldehyde as a reducing agent, because it is pleasanter for the patient and apparently just as efficient.

In order that the application may be effective, the tooth surfaces should first be thoroughly cleansed by the usual procedure, using with the pumice or polishing powder a small quantity of a solution of tartaric acid or cream of tartar which will coagulate the colloid matter accumulated upon the surface of the tooth. The tartaric acid will also combine with the toxic products of protein cleavage incident to the progress of the caries. Should this gangrenous mass in the incipient cavity remain undisturbed, it will restrict the penetration of the silver nitrate in proportion to the density of the mass.

Failure to appreciate that the overlying mass of disorganized dentinal fibrils and other débris, if undisturbed, will limit the efficiency of the silver nitrate application may sometimes have caused doubt as to the efficiency of dental applications of silver nitrate. This doubt, together with natural reluctance to use an agent which at times causes such definite stains, has prevented silver nitrate from receiving the general recognition in this field that it deserves.

The principal and only objection to the use of silver nitrate as an agent to restrain the progress of caries in human teeth is that it makes so definite and permanent a discoloration. This discoloration, however, is not always noticeable when used on the molars because of their position at the back of the mouth. Silver nitrate stains are scarcely more conspicuous or a greater

Clinic presented at the Thirty-Fourth Annual Meeting of the American Society of Orthodontists, St. Louis, April 20-23, 1936.

disfigurement than many of the large and unpolished amalgam fillings so often found in premolars and molars. The objection to the discoloration loses force when it is remembered that almost every one of these filled cavities was once a small carious spot that was then perfectly controllable through application of silver nitrate, the stain from which would have been relatively inconspicuous; and that the pain, expense, and loss of tooth substance incident to making an objectionable and impermanent filling would have been avoided.

The effort thoroughly to cleanse the tooth in preparation for the application of the silver nitrate sometimes discloses a sensitive spot at the gingival margin. A second application of the silver nitrate and eugenol after a quarter or half hour and a thorough polishing of the previously sensitive area, which has become far less irritable, will make it possible to deposit the metallic silver of the ammoniacal solution in the disorganized lime salts of the matrix, and also to reach the immediate point of irritation to the fibrils, and there produce an impervious eschar of silver proteidinate. The efficiency of the treatment seems to be directly in proportion to the diffusibility of the agent into the dentin, and the deposition of free silver ions which make the area bacteriologically sterile. By this it is also apparent that the silver nitrate is here definitely self-limiting, and that while originally caustic in its action, there need be no fear of tissue destruction to restrain its use where indicated.

It may be said in regard to the staining caused by silver nitrate, that on a thoroughly polished tooth surface the silver nitrate makes no impression and leaves no stain if the enamel is not defective or disorganized, while at the same time the penetration is in direct proportion to the depth of the defect or disorganization. From this it can also be readily seen that this agent is diagnostic in its reaction, which warrants the conclusion that every stainable spot or pit will inevitably become a definite cavity, and that every such place should be cared for when first discovered.

Through a considerable period of use it has become apparent that defective grooves, and areas of incipient disorganization of enamel at the gingival borders of molar teeth, may be dependably protected against the progress of caries if the technic of the application of ammoniacal silver nitrate is accurately carried out.

Though it is a question whether it is not harmful to the area which has been given protective treatment, the silver nitrate stains may be bleached, if desired, by the use of potassium iodide or Churchill's iodine followed by alcohol or ammonia.

The method of applying the agent is extremely simple; though it is important that the tooth be quite dry when applying silver nitrate, which should remain for from 20 to 40 seconds before following it with the reducing agent, after which the area may be wiped off with alcohol to take up the excess of eugenol. One of the most satisfactory methods of application is by the use of spunk cut into small cubes, which will be a satisfactory nondripping vehicle. The agent should be used tidily as it will otherwise stain the lips and mucous membrane, although the gum tissue immediately adjacent to the point of application will not be seriously injured if stained by the silver nitrate.

43 Farmington Ave.

# CONSTRUCTION OF STAINLESS STEEL APPLIANCES WITHOUT SOLDERING OR ELECTRIC WELDING*

PROF. DR. PAUL W. SIMON, BERLIN, GERMANY

YOU all know the great advantages of using stainless steel in orthodontics; nevertheless many practitioners prefer other metals for orthodontic treatment because they are afraid of the various difficulties in soldering or welding stainless steel appliances. Though soldering has recently been improved very much, there is no denying that the soldered steel loses its original elastic and chemical qualities unless it is given a rather complicated special postsoldering treatment.

The problem to be solved was how to construct stainless steel appliances in a way which made soldering or welding unnecessary.

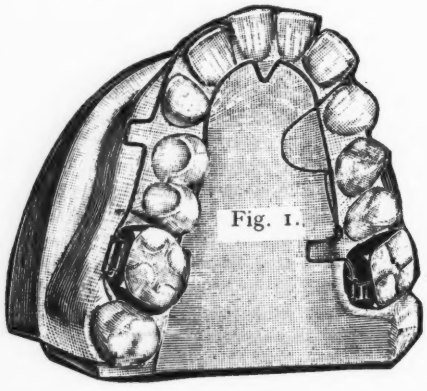


Fig. 1.

The whole appliance shown in Fig. 1 is of stainless steel, and neither the anchor bands, nor the locks, nor the auxiliary springs are soldered or welded. They are constructed as follows:

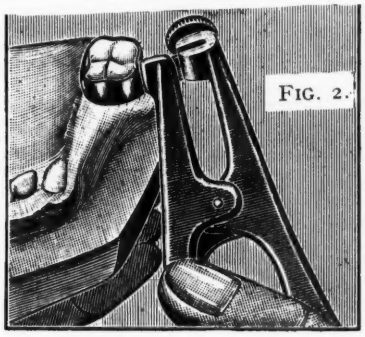
The bands are fitted directly to the anchor teeth. A strip of stainless steel metal, 5 mm. in width, 0.1 mm. in thickness, and 6 c.m. in length, is put into a pair of artery forceps and shaped with a pair of contouring pliers. Then it is drawn tight by using a pair of band-forming pliers (Fig. 2). This process of drawing tight shapes two sharp edges in the Wipla band (Fig. 3), which now can be removed from the mouth for the following process. Instead of soldering as usual, the band is folded. For folding we use a pair of folding pliers (Fig. 4).

The first diameter is 2 mm., the second 5 mm., in width. The ends of the band are cut, so that one end is 2 mm., the other one 5 mm., in length. The last 2 mm. of the longer end are turned to the inside and the two ends are joined

*Read before the European Orthodontological Society, Scheveningen, Holland, May, 1934.

like two hooks. The angle at the edge must be flattened (Fig. 5). The folding joint is pressed with the pliers firmly so that it is impossible to refold it; thus the strip of metal has become a firmly closed ring (Fig. 6).

With the anchor bands made in this way, the lingual and buccal tubes for supporting the arch wire must then be fixed to them. The tubes are not soldered either: you can construct them yourself if you do not prefer to buy them. They



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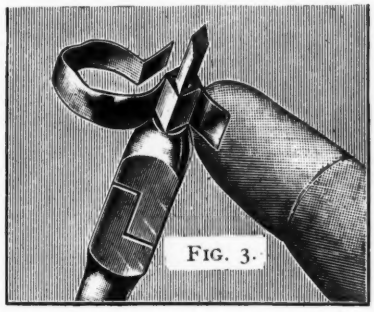

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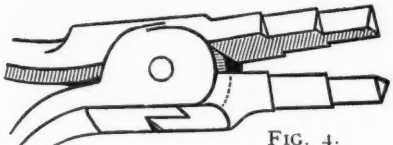

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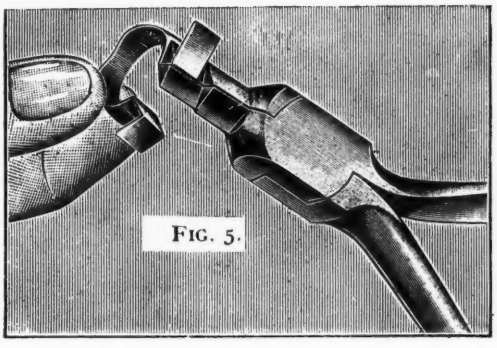

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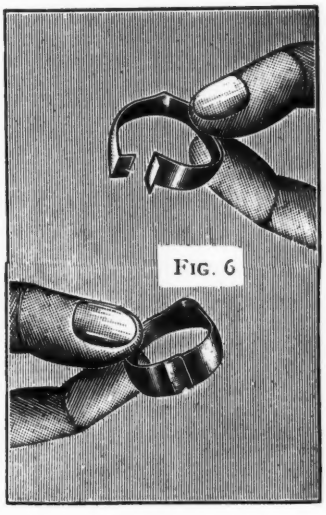
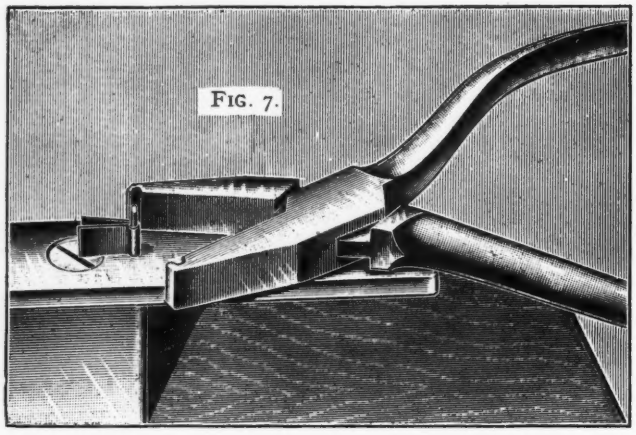


FIG. 6

are made out of the same material. A strip of Wipla metal, 5 mm. in width and 20 mm. in length, is put on a vertical peg which has the diameter of the tube wanted (Fig. 7). The strip is pressed around that peg by a special pair of pliers, and thus it gets the shape of the tube. After being taken away from the peg, a buckle (simply a bent piece of steel wire 0.4 mm.) is slid over the ends of the strip to hold them together (Fig. 8). The ends then are drawn apart, and the whole tube is firmly pressed in a special pair of pliers (Fig. 8). It is, of course, necessary to put a pin into the tube, to prevent deformation of the

tube by the pressure. After that process you can fold the tube over the band (Fig. 9). The buccal tube must be horizontal, the lingual one neither horizontal nor vertical, but sloping (Fig. 10).



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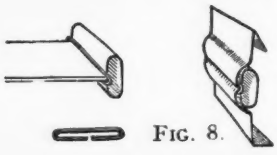

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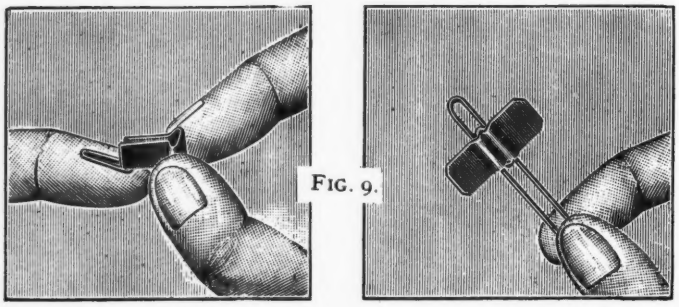

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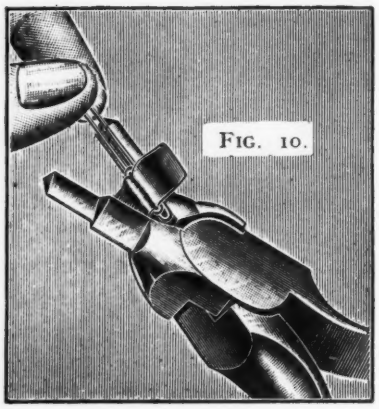

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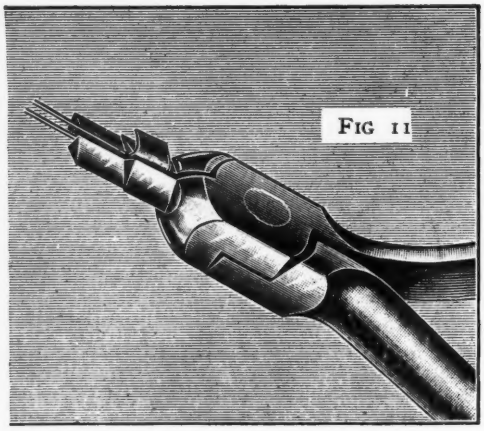
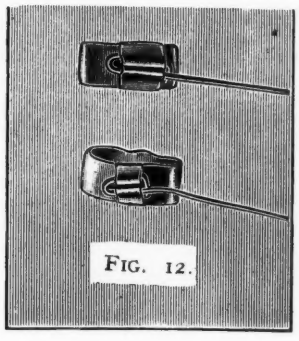


FIG 11

The lingual tube is constructed similarly. There are only two differences between the lingual and buccal tubes: (1) the sloping position of the lingual tube; (2) its difference in length—3 mm. instead of 5 mm.

The folding edges of the tubes are prepared by the above-demonstrated pair of pliers, so that to fix the tube on the band you need only to slide the tube over the band and to press the folding edges together. By pressure with the fissure pliers you prevent sliding of the tube along the band (Fig. 11).



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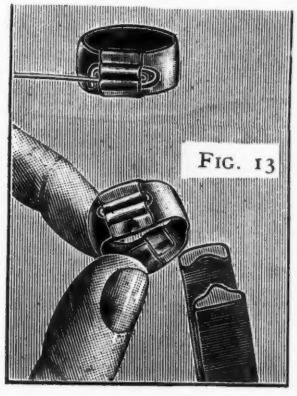

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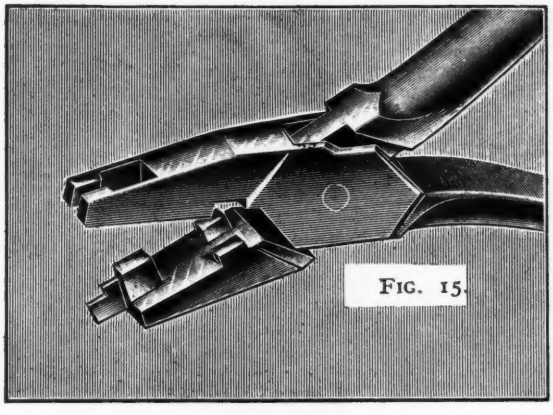

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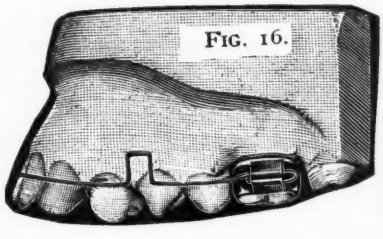

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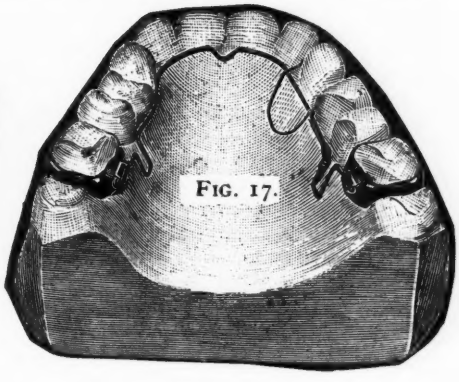

FIG. 17.

You now have the anchor bands with the tubes. The labial arch is attached to the buccal tube by a simple bending of the arch wire (Fig. 12). This is done by bending with only one pressure with a pair of special pliers. In front of the tube the end of the wire is bent rectangularly, to prevent sliding of the pin through the tube (Fig. 13).

The arch wire has a rectangular loop in the region between the canine and the bicuspid, which serves to lengthen or shorten the arch and to fix intermaxillary elastics (Fig. 14).

The lingual arch is as simple as the labial one. The lock pin is only 3 mm. in length, the two rectangular loops for lengthening or shortening the arch are in front of the lingual lock, and there is a third loop with only three angles between the incisors, to avoid hurting the papilla incisiva, and to serve as means for attachment of auxiliary springs (Fig. 15).

These springs are not soldered to the arch, but are bent around one of its angles. A piece of wire 0.4 mm. is wound three times round each side of the angle, and in this way so fixed that it cannot move (Fig. 16).

Thus, without soldering or welding, it is possible to construct a whole orthodontic appliance, to use all the advantages of stainless steel, and to avoid in this very simple way all its disadvantages.

# Department of Oral Surgery

Edited by

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## RESULTS AND PROGNOSIS OF CANCER IN AND ABOUT THE ORAL CAVITY

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IN THIS summary both the irradiation results and the surgical results are outlined briefly. These are not presented with the idea of presenting surgery versus irradiation but to give a general survey of what has been found to occur in the past.

Lane-Claypon in a report on "Cancer of the Lip, Tongue and Skin" commented on the value of statistics on cancer of the tongue which may be taken as representative as follows: "As a whole, the literature dealing with the late results of treatment of cancer of the tongue is unsatisfactory for statistical analysis. Although there is a fairly large bibliography, many of the papers are of little or no value for this purpose. Efforts were made to utilize every possible series of cases by extracting information from the clinical notes given and by a careful and detailed study of the papers themselves. But in some instances the authors had thrown the information into a form which was unadaptable, and which could not be used statistically.

"The results of treatment of cancer of the tongue as recorded in the literature form a mixed sample. It has rarely been possible to separate the different stages of the disease or the different parts of the tongue.

"The statistical position for the results of radiotherapy is perhaps worse than it is for those of operation. Here, in some cases the glands of the neck on one or both sides are removed surgically, causing a number of deaths from operation. These are not always stated, nor the stage of the disease at which the patient was treated. Further, the methods of radiotherapy used vary not only in the different clinics or institutes, but are altered at individual clinics with the growth of experience during the period reported upon. For the above reasons the presentation of the data dealing with the results of radiological treatment of cancer of the tongue is unsatisfactory."

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This is the tenth article of a series upon the subject of malignancy in and about the oral cavity. All phases of the subject are to be included.

One of the most important factors in judging surgical results is the type of cases accepted for operation. For example, it is difficult to compare the statistics of Judd and New, with 40 per cent operability, with the statistics of Blair with 80 per cent operability. Again it is difficult to gain an idea of the type of cases called inoperable or operable, even when they are listed. In giving radium statistics, often they are listed as operable and inoperable according to the individual presenting the statistics as in Regaud's statistics. Another man, however, might judge the case differently.

Undoubtedly radium and intense x-ray therapy have caused a transition in the therapy of cancer in this region. About a dozen years ago it began to be quite evident to those treating cancer about the face, mouth and jaws that besides being familiar with and able to do radical surgery, one has to be familiar with and able to use radiation methods. Because of the newness and ease of application and sometimes rather unique results it seems to me that the enthusiasm for a type of therapy entailing very little surgery has been overdone in certain enthusiastic circles.

To become dogmatic concerning the treatment of cancer in and about the intraoral region is particularly dangerous. Each case has to be individualized. If we are to lean to a certain extent upon the conception of radiosensitivity, it must be remembered that clinical observation records many examples of radioresistance in lesions which according to microscopic picture should have been proved highly radiosensitive and also that the converse is true. Again there is no question but that the gross characteristics of the lesion, whether it is papillary or infiltrating in character, may be just as important a guide to radiosensitivity as the microscopic appearance of the lesion.

*Epithelioma of the Lip.*—Von Bonsdorff emphasized that in evaluating cures of epitheliomas of the lip, cures of three years' duration tell little; cures of five years are necessary, as 10 per cent of the cases recur after three years.

The surgical results may be fairly accurately represented by those given by Brewer, who united the cases of several of the best American clinics. Those cases without involvement of the lymph nodes in which the lymph nodes were removed showed 92 per cent remaining well for five years or more. In the same group if the lymph nodes were not removed, the five-year cures fall to a percentage of 62 per cent. When the lymphatic nodes were already involved 34 per cent remained well for five years or more.

Kennedy recently published 147 cases of carcinoma of the lip which were treated by surgical excision and routine neck dissection as a rule. Sixty per cent had palpable nodes when first seen, of which 33 per cent proved to be cancerous under the microscope and in 14 per cent without palpable nodes microscopic cancer was found within the nodes. Sixty were well over three years, 31 were well over five years. Thirty-two patients with metastasis were alive and well.

Fischel has recently reported the five-year end-results of 66 cases of carcinoma of the lip with routine suprahyoid lymph node dissection. Only 2 died of local recurrence in the lip. Only 7 died with carcinoma in cervical lymph nodes. None died of systemic metastasis. Thirty-eight (57.6 per cent) were free from evidence of disease after five years. Seven died in the meantime of causes other than cancer, and five were not traced. In this series 37 cases

had palpable nodes. After microscopic study, 27 were diagnosed hyperplastic and 10 carcinomatous. In 13 cases without palpable nodes, 2 showed carcinoma when examined microscopically. Six of 16 patients with proved metastasis of the lymph nodes (37 per cent) lived five years or more. Fischel contends that grading was of more academic and prognostic interest than as a guide to therapeutic effort. In Grade I, 10 cases, there were 9 (90 per cent) five-year cures. In Grade II, 38 cases, there were 22 (31 per cent) five-year cures. In Grade III, 13 cases, there were 4 (31 per cent) five-year cures. In Grade IV, 1 case, no cures. Four cases were not graded.

New and Figi (1935), who in general excised the primary lesions and bilaterally removed the submental and submaxillary nodes and other nodes as indicated with radiation as supplementary treatment, report the following five-year cures for carcinoma of the lip: of 234 patients with nodes not involved but dissected 89.7 per cent were cured; of 196 with nodes not involved but not dissected 65.8 per cent were cured; of 46 cases with nodes involved and dissected 39.1 per cent were cured.

The statistics that can be presented for radium might be fairly well represented by those of Regaud which were reviewed to Dec. 31, 1927, and are tabulated so that they can be reduced to five-year cures. Thirty per cent of his cases were classed as operable and 24 per cent as questionably inoperable. Twenty-eight per cent are living five years or more after treatment. Another point of interest in Regaud's cases is the percentage of clinical disappearance of primary lesions treated, which were in the inoperable cases 17.8 per cent, in the questionable operable 91 per cent, and in the operable cases 98 per cent.

In epidermoid carcinoma of the lip, radium properly applied (see discussion of radium dosage for squamous cell carcinoma) caused the local lesion to heal when applied fairly early in over 90 per cent of the cases. As the disease progresses, the percentage of local regressions decreased about as Regaud's statistics indicate (quoted above). Surgical excision followed by simple plastic surgery shows as good results. Some cases not radiosensitive can be controlled or obliterated by surgery after radiation has failed for one reason or another. Surgical treatment allows thorough microscopic study without cutting into the carcinomatous ulcer.

It may thus be stated that so far as the local lesion is concerned in cancer of the lip, there is no great difference in the aggregate percentage of eradication whether surgery or radium is used. In some cases both are advisable. In those cases subjected to thorough radiation without complete healing, surgery is a forced choice and not by any means a hopeless one when courageously carried out.

*Tongue and Neighboring Mucosa.*—Better statistics have always been kept of the malignant lesions of the tongue and neighboring mucosa than of elsewhere about the oral region. Obviously, results following operation will depend upon the type of cases selected for operation.

(1) *Surgical Results.*—Years ago Butlin in 197 tongue cases had twenty operative deaths (10 per cent) but 31 per cent of the patients lived over three years. Of 44 patients on whom gland dissections were not performed, 29 per

cent showed cures, and of 57 with gland resection 42 per cent showed cures. His cases were moderately advanced and spoke for gland resection.

It will always be interesting to present Butlin's analysis of 70 cases in which he was allowed to complete the operation in the manner he advocated: namely, (1) the operation in two stages is much safer than one; (2) as the glands are involved early in lingual carcinoma and as the lymphatics between the local lesion and the glands seem to escape, a neck dissection en bloc of the immediate tributary triangles according to location and extent was advised.

| | |
|---|---|
| Died of operation | 6 |
| Lost sight of | 1 |
| Died of recurrence in the mouth | 9 |
| Died of recurrence, uncertain (in one of these the gland could not be entirely removed; operation was abandoned) | 7 |
| Died of recurrence in the glands (in one the submaxillary salivary gland was left and the disease recurred beneath it; in the other seven cases the glands were enlarged at the time of their removal, and in five cases they were demonstrably cancerous) | 8 |
| Died of cancer on opposite side of tongue | 1 |
| Died of affection of the glands on opposite side of neck | 2 |
| Died of other disease within three years | 1 |
| Cases not countable (operation too recent) | 11 |
| Successful cases | 24 |
| | 70 |

The successful cases were calculated in the 70 cases after deducting cases not countable (11), the patient who died within three years of another disease (1), and the patient who was not traced after operation (1), leaving 57 cases with 24 successful cases—42.01 per cent. Ten of the patients operated were over sixty-five years of age and one was seventy-seven years old. The causes of death were hemorrhage (1), suffocation (1), septic pneumonia (4); total (6). It has been stated that these results cannot be duplicated. With local anesthesia and proper selection of cases and the two-stage operation in most instances, my own observation leads me to believe that they possibly can be bettered. Often surgeons in this country have in the past been too anxious to do the ideal operation in one stage so that their operative mortality has been too high to be easily justified even in a disease 100 per cent fatal unless cured. Irradiation methods have at least put the surgeon in the position where he must justify his operative mortality.

Rieder analyzes 93 cases of carcinoma of the tongue in regard to prognosis. They were treated by operation with a mortality of 25 per cent. An attempt was made to determine the prognosis of the growth on the following criteria: location, direction of the growth, character, extent and duration of the lesion. He used 82 cases treated from 1908 to 1928 and reported in 1932. He grades his cases clinically as follows: Grade I, ulcers which are still superficial; Grade II, when the lesion penetrates deep. Nine patients in Grade I are well from four to twelve years, i.e., 50 per cent. In cases of Grade II he had no lasting cures. The total incidence of cures over four years was 18.7 per cent.

Moure in 57 cases of carcinoma of the tongue treated surgically from 1920 to 1930 had 16 operative deaths. Thirty-five cases operated from 1920 to 1923 showed a mortality of 28.74 per cent; 30 cases operated from 1923 to 1930 showed a 7.5 per cent mortality. He has 40 per cent of 57 patients cured from two to ten years.

(2) *Results of Radium Therapy of Cancer of the Tongue Combined With Conservative Surgery for the Lymphatic Areas.*—Quick in 450 cases of carcinoma of the tongue has 22.4 per cent clinically free from the disease. Of these 35 per cent were operable on admission, 50 per cent inoperable and 15 per cent just beyond operability. Of a series of 160 cases with palpable nodes 12 are clinically free; 103 developed metastasis under treatment or later; 16 of these are clinically free; 186 had no palpable nodes at the time of admission or during treatment. Seventy-three per cent of these had not developed clinical evidence of metastasis.

Roux Berger (Curie Foundation) divided his lingual cases, 386 in number, into first degree lesions (2 cm. or less), second degree lesions (larger than 2 cm. to one-half of the tongue), third degree lesions (more than one-half of the tongue and floor of the mouth), and fourth degree lesions (whole of the tongue and neighboring tissues). In the body of the tongue in the first group he obtained (47) 44 per cent five-year cures; in the second group (81) 22 per cent; in the third group (50) 10 per cent; and in the fourth group (20) 5 per cent. These cases were treated by radium and neck dissection. In the base of the tongue, first group (2) 50 per cent, second (21) 20 per cent, third (28) 13 per cent, and fourth (40) none. In the floor of the mouth group, first group (6) 50 per cent, second (21) 38 per cent, third (32) 9 per cent, and fourth (34) 18.8 per cent.

Spencer and Cade (1931) in 169 (1925-1930) cases of cancer of the tongue taken as they came and treated by irradiation methods for the local lesion and neck dissection as indicated, obtained a disappearance of the local lesion for the time being in 126 cases (74 per cent). Later 43 (25 per cent) recurred locally. One hundred thirty of these patients had involved glands and 83 of these were considered inoperable. Of the 130, five lived from four to five years, 13 for three years, 24 for two years, and 84 for one year or less. Four apparently were untraced. The survival rate was out of 18 cases, 2 (11 per cent) for five years; out of 16 cases, 3 for four years (18.7 per cent); out of 23 cases, 6 (26.5 per cent) for three years; out of 33 cases, 16 (48.8 per cent) for two years; out of 47 cases, 30 (60.3 per cent) for one year; out of 32 cases, 16 (50 per cent) for less than one year.

(3) *Radium and Surgery in Cancer of the Tongue Combined With Surgery for the Lymphatic Areas.*—Recently Berven (Stockholm) using radiotherapy combined with endothermic surgery has attained three-year cures in 15 out of 20 cases of cancer of the tongue or 75 per cent, and five-year cures 7 out of 12 cases or 58 per cent. Two of the patients surviving five years had glandular involvement metastasis at the beginning of the treatment. Although this group is small, it appears that a combination of irradiation and surgery as practiced by Berven had best be considered as the method most likely to effect a cure. These results are truly remarkable.

New and Figi, who in general excised the local lesion with diathermy and inserted radium subsequently and removed the lymph nodes in all but Group IV (Broders) and gave postoperative radiation to the neck, reported in 1935 the following five-year cures for cancer of the tongue: of 58 patients with nodes not involved but dissected 50 per cent were cured; of 36 with nodes not involved

but not dissected 52.8 per cent were cured; of 56 patients with nodes involved and dissected 14.3 per cent were cured; and of 6 with extension to the floor of the mouth 33.3 per cent were cured.

*Carcinoma of the Tongue and Buccal Cavity in General.*

(1) *Surgical Results in Carcinoma of the Buccal Cavity in General.*—Judd and New with 40 per cent operability presented 118 cases of carcinoma of the buccal cavity of which 80 per cent were traced, 31 per cent were free from the disease for over three years and 24.5 per cent for over five years. The operative mortality was less than 1 per cent. Advanced cases were not accepted. Neck dissections were performed as indicated.

Simmons in 1931 reported 763 cases of buccal carcinoma from the Colles P. Huntington Hospital and the Massachusetts General Hospital. The tumors were graded according to Broders' classification. He concluded that the prognosis depends more upon the degree of malignancy than upon any other factor. A cure (five-year) was obtained in 66 per cent of 30 cases of Grade I, 34 per cent of 31 cases of Grade II, 8 per cent of 24 cases of Grade III, and none of 15 cases of Grade IV. He also concludes that the degree of malignancy can often be estimated clinically. Of these 763 cases, 227 or 31 per cent showed no evidence of metastasis. Only 48 or 6½ per cent were operated radically. In 73 cases with evidence of metastasis, a wide local operation was done. The remainder were treated by the usual irradiation methods combined with surgery or irradiation alone. Thirty-eight per cent of the 73 patients who underwent wide local excision were living and well after five years, but in all of these the lesion was of low grade malignancy. He advises in suitable cases without evidence of glandular metastasis a radical neck dissection. Of 23 cases with enlarged glands operated radically, local lesions and glands, a cure was obtained in 17 per cent. Of 25 cases without palpable glands but operated radically, 34 per cent were cured. The total mortality was 2 per cent.

Simmons in analyzing his 1924 to 1927 cases of buccal mucosa carcinoma after five years, in 1931, showed the following results for operative treatment: of 42 cases of the tongue, 12 (29 per cent) were five-year cures; of 7 cases of the floor of the mouth, 2 (30 per cent) were five-year cures; of 13 cases of the cheek, 6 (48 per cent) were five-year cures; of 13 of upper jaw, 8 (58 per cent) were five-year cures; of 14 of the lower jaw, 5 (26 per cent) were five-year cures; of 2 of tonsil, 1 (50 per cent) was a five-year cure; and of 1 of the palate, 1 (100 per cent) was a five-year cure; total of cases was 92; total of five-year cures was 35 (38.5 per cent).

His mortality was only 1 case in 109 operations (9 per cent). The point about these cases is that those subjected to surgery were very carefully selected. When the chances seemed to be better by the use of irradiation because of the extent of the disease, the clinical and microscopic malignancy of the disease or the general condition of the patient, irradiation methods were used. His conclusion is that in the type of case which they selected for surgery the results of surgery are superior to those obtained by irradiation methods.

Fraser in 68 cases of carcinoma of the buccal cavity obtained a cure lasting two years or longer in 23.5 per cent, with an operative mortality of 29.4 per

cent. Those without glandular involvement obtained a cure in 35.7 per cent with a mortality of 5 per cent. In those cases with glandular involvement a cure was obtained in 3.8 per cent, and death resulted in 42 per cent. In 24 cases in which the operation was performed in two stages, the mortality was 8.3 per cent; whereas, when the operation was performed in one stage, the mortality was 52.6 per cent.

Blair, who accepts cases more advanced than most surgeons, presented the following statistics in 73 cases in 1924: 64 per cent of the cases of carcinoma of the buccal cavity were far advanced or inoperable when first seen; 80 per cent of this 64 per cent were radically operated, with an operative mortality of 23.5 per cent in 73 cases; 40 of the 73 cases were operated three years before this report; 11 of the 40 (27.5 per cent) represent three- to seven-year cures, 9 of the 40 were dead from some other cause, 20 of the 40 were not traced. Of the 33 operated less than the three years, 5 are well after two and one-half years, 2 are well after two years, and 5 more than one year.

Blair in 1932 presented 212 cases of buccal carcinoma. The early cases of buccal cancer by surgical methods, after subtracting the operative mortality, show 66 per cent five-year healing; median cases 72.4 per cent; and advanced cases 32 per cent; with a 21.5 per cent mortality in all.

Fischel in 1934 published 112 cases of carcinoma of the mouth, nasal sinuses, pharynx and larynx treated mostly at the Barnard Free Skin and Cancer Hospital in St. Louis after five years. These cases were treated by routine radical dissection of the lymph nodes and wide excision; 19.6 per cent were free from evidence of carcinoma for five years. The operative mortality was 37.5 per cent. Only 10 of his cases did not have palpable lymph nodes; 7 of these showed microscopic cancer; but 24 cases with palpable nodes showed no evidence of cancer, and 64 with palpable nodes showed cancer. He also analyzed and graded the lesions according to Broders' classification: 2 cases were Grade I; 54 cases were Grade II; 46 cases, Grade III; and 5 cases, Grade IV. Five were not graded. The five-year cures ran as follows: Grade I—1 (50 per cent), Grade II—12 (22 per cent), Grade III—7 (15.2 per cent), Grade IV—1 (20 per cent). He states that the grade of the primary lesion is more of academic and prognostic interest than as a guide to therapeutic effort.

Although some increase in cures of advanced cases has been made by some men, such as Blair and Fischel, by unusually radical surgical methods, the mortality and the mutilation are correspondingly increased.

One can still state that the statistics of Butlin, Bloodgood, Judd, New, Blair and Fischel indicate that surgery alone when properly done in cancer of the buccal cavity offers about 60 to 65 per cent chance of a cure in the very early cases, about 30 to 40 per cent in the moderately advanced cases, and about 15 to 20 per cent chance in the advanced cases when operated by very radical methods. The operative mortality should be kept below 20 per cent in advanced cases radically operated by methods advocated by Blair. From this high point the operative mortality should fall to practically no deaths in the early lesions.

At the present time the radical method formerly advocated by Blair may be regarded as too radical. It is better certainly to let irradiation methods

handle such advanced cases unless they have been tried and demonstrated to have failed. Ordinarily by this time the picture is a hopeless one.

(2) *Radium in Cancer of the Buccal Cavity in General Combined With Conservative Surgery for the Lymphatic Areas.*—On the other hand, radium statistics may be represented by those of Regaud of Paris. His statistics for cancer of the mouth which include all cases seen are revised to Dec. 31, 1927. When reduced to five-year or longer "cures," the statistics show 121 with 17.3 per cent (21) clinical cures. His three-year cures figured on the same basis show 230 cases with 18.2 per cent (42) clinical cures. Regaud removed the lymph nodes en bloc, and as a rule intensive external irradiation is used. Thirty-six patients were excluded on account of death during treatment; 275 remained; about 89 were classed as inoperable; 57 patients died of metastasis to the regional lymphatics; 77 or 28 per cent survived for periods of from one to six years. Less than one-half of these survived for three years or more. Twenty-four of the patients had no palpable glands. In 18 of these no treatment of the glands was given and 14 were cured—a very interesting point in regard to metastasis. Six of the 24 patients received radium to the neck and 3 remained cured. That is, 21 out of 24 cases without palpable nodes did not show evidence of metastasis—a statement which argues for a conservative attitude toward the glands. The primary lesion was arrested for the time being in 43.8 per cent of the cases, or less than one-half.

Forssel (Stockholm) presents 160 cases of mouth cancer, 72 of which had lymph node involvement. In none of the 72 cases was there a single one-year cure by irradiation alone, but by surgery of the glands combined with radiation he obtained 35 per cent three-year cures and 30 per cent five-year cures (10 out of 27 cases).

Berven by a combination of teleradium and interstitial irradiation and endothermic excision of the local lesion and bloc dissection of the glands after external irradiation when palpably enlarged can report from 1916 to 1926 five-year cures as follows: 32 per cent of lingual cancer, 18 per cent of cancer of the mandible, 26 per cent of buccal cancer. Of 278 cases of intraoral cancer 76 or 27 per cent were free from symptoms for five to eleven years.

Berven in 1932 published his results for eleven years in carcinoma of the buccal cavity. In 278 cases 76 or 27 per cent were free from symptoms for five to eleven years. The location and the percentage of healed cases were: sublingual, 34 per cent; mandibular involvement, 18 per cent; buccal mucosa, 26 per cent; and tongue, 32 per cent.

*Results in Epidermoid Carcinoma of the Cheek and Palate.*—Simmons in 13 cases treated by surgery reports 48 per cent five-year cures. On the other hand, Brewer quotes 15 cases treated by radium showing 35 per cent cures for three years. Martin and Pfluger in 1935 reported 99 cases of cancer of the cheek from Memorial Hospital. External and interstitial radiation formed the basis of treatment. Thirty per cent were free of disease at the end of five years.

Harmer collected 512 cases of malignancy of the palate and cheek from the literature and found 67 alive and well for three to five years. Of his own cases, 35 in number, 11 patients are living and free from disease after treatment by endothermy and radium.

*Carcinoma of the Lower Jaw.*—New and Figi in 1935 reported the following five-year cures for carcinoma of the lower jaw. The local lesion was destroyed by surgical diathermy and the lymph nodes were removed if the mucous membrane of the cheek or the floor of the mouth was involved. Radiation was used as a supplement. Of 38 patients with nodes involved 28.9 per cent were cured. Of 113 patients with nodes not involved 69.9 per cent were cured. Simmons in the statistics previously quoted had 14 cases of carcinoma of the lower jaw. These were treated by excision; 26 per cent were well after five years.

*Results of Combined Irradiation and Surgery in Carcinoma of the Antrum and Other Paranasal Sinuses.*—Hautant and Monad (Paris Radium Institute), in carcinoma of the ethmoid and orbital region, in 21 cases report 38 per cent from four to eleven years cured by the use of radium within the nose plus external irradiation.

New and Figi in 1935 reported the following five-year cures for carcinoma of the upper jaw and antrum. The growths were destroyed by surgical diathermy and subsequently thoroughly irradiated. Of 75 patients primary in the antrum 40 per cent were cured. Of 43 patients, secondary in antrum 53.4 per cent were cured. Of 118 patients with upper jaw and palate involved 62.7 per cent were cured.

Ohngren (1934) (Stockholm) reported 38.5 per cent five-year cures of malignant tumors of the maxilloethmoidal region, mostly by the use of electrosurgery followed by radium. The earlier cases were treated before his present technic was perfected.

*Epidermoid Carcinoma of the Mesopharynx.*

(1) *Irradiation Results.*—The Radium Institute, London, presented 57 cases of epidermoid carcinoma of the mesopharynx treated from 1925 to 1929 inclusive. In 1933, 5 were alive, 38 were dead, 9 untraced, and 5 untreated. S. Cade up to 1930 had treated 12 epitheliomas of the tonsillar region with radium locally. In 9 of these the glands were enlarged; 5 were considered inoperable. The primary lesion disappeared in 8 for the time being, but in 3 there was a local recurrence. The well cases were: 1, five years; 1, three years; 1, two years; and 2 more than one year.

Harmer in 1931 collected 606 cases of carcinoma of the tonsil and mesopharynx from the various radium institutes and found 126 living free from disease of whom only 36 were living up to one year, and 2 were living five and ten years later respectively.

In 1932 Berven reported 18 patients with epithelioma of the mesopharynx treated by the new method of external mass radiation supplemented by internal surface irradiation, interstitial irradiation and endothermy: 55 per cent were healed primarily, and 39 per cent were freed from disease for three years.

Duffy in 122 cases of malignant tumor of the tonsil treated at Memorial Hospital found 42 per cent without palpable nodes, 30 per cent with operable nodes, and 28 with inoperable nodes of 49 patients treated between 1921 and 1924. He reported 20.4 per cent free from disease of this group for from five to nine years.

Coutard in 1932 by external irradiation in epithelioma of the tonsillar region in 46 cases obtained 13 (28 per cent) five-year cures and 8 (17 per cent) seven-year cures.

In regard to the number of cases of this region which develop metastasis after irradiation treatment, it is stated by Duffy that in 123 cases he found only 29 that developed metastasis later. (See also under Coutard's results.)

Harmer in 1931 was not able to find records of long standing cures of carcinoma of the nasopharynx.

The surgical results for carcinoma of the hypopharynx are difficult to obtain a line on. New and Figi's report on laryngectomy in 73 cases showing 56.1 per cent five-year cures contains some of these cases, as certain ones had laryngectomy because of encroachment from the outside, but they have not separated them. Epiglottic tumors are of low grade malignancy and are best taken care of either by suspension apparatus and diathermy when small or by pharyngotomy when extending to the aryepiglottic fold and artymoid region. Laryngopharyngeal epitheliomas (pyriform fossa and past cricoid tumors) are usually of high grade malignancy and metastasize before they are diagnosed. Early surgery may offer something, but usually they present themselves too late for surgery to be of great value.

In 1931 Harmer collected 520 cases of carcinoma of the hypopharynx from various centers, using principally irradiation: 59 patients were living, and only 21 were free from disease from one to five years.

Cade was unable to show any cases of pyriform fossa cancer free from disease by irradiation methods after interstitial irradiation and external x-rays. At present with the addition of the radium "bomb" he has been able to heal a number of reported cases.

The best irradiation results for epithelioma of the hypopharynx proper are those of Coutard. He obtained 22 per cent two-year healing in 89 patients treated. After three years 14 per cent of the 89 were healed.

(2) *Results of Combination of Surgery and Irradiation.*—New and Figi in 1935 reported the following five-year cures for malignant tumors of the pharynx and tonsil, exclusive of nasopharyngeal tumors. Primary lesions of low grade malignancy were removed by diathermy as the lymph nodes were dissected. For lesions of high grade malignancy radiation methods were used. For squamous cell epithelioma in 34 patients 26.5 per cent were cured. For lymphocarcinoma of 11 patients 54.5 per cent were cured.

(3) *Surgical Results.*—Trotter has described surgical cure of carcinoma of the hypopharynx and spoken encouragingly of it, but he has not reported his results.

*Intensive External Irradiation for Pharyngeal and Laryngeal Epitheliomas.*—In 1932 Coutard (Radium Institute, Paris) reported on 212 patients with epithelioma of the tonsillar region, of the hypopharynx and of the larynx, treated during 1920 to 1926: 157 died the first two years; 55 (26 per cent) were healed of their primary carcinoma without any local recurrence: 12 of 46 (26 per cent) were in the tonsillar region; 18 of 89 (20 per cent) in the hypopharynx; 25 of 77 (32 per cent) in the larynx. Recurrence of late metastasis two years after treatment were 1 out of 12 (8 per cent) for tonsillar region, 8 out of 18 (44 per cent) for the hypopharynx, 1 of 25 (4 per cent) for the larynx. It would seem from these figures that distant metastases are not very common after the local lesion is healed in cancer of the tonsillar regions

and even less common in cancer of the larynx. The results of cancer of the hypopharynx were damaged somewhat by late metastasis. Three years after treatment of the 212 patients (1920 to 1926) 50 patients remained healed, 23 per cent in all, tonsillar 25 per cent, hypopharynx 14 per cent and larynx 32 per cent. Five years after treatment of 162 patients (1920 to 1925) 16 per cent in all remained healed, 18 per cent tonsillar, 10 per cent hypopharynx, 21 per cent larynx. Since 1926 his results from cancer of the tonsil have increased. The primary and the glandular invasion has been healed in 46 per cent.

Coutard states there is a type of epithelioma of the larynx, located on the cord glottis or even subglottis, small or attaining large size, infiltrating the muscles little and leaving the larynx its normal mobility, that is easily healed by radiation. Surgery also cures a large portion of them. When radiation fails, the tissues are left in a condition which makes surgery dangerous; whereas recurrence after surgery can safely be treated by irradiation. If cancer of the cord has infiltrated the muscles and immobilized it and especially when it has extended to the cartilages or provoked a perichondritis and when the histologic examination suggests a radioresistant type of cell, roentgen therapy usually fails, even when the tumor is small. A previous partial operation, with resection of the greatly infiltrated parts and infected masses adherent to cartilage, can put such a growth in a condition in which roentgen irradiation can cause final disappearance of the lesion (Coutard). In 1926 this type of treatment was used by Coutard (combined surgery and radiation) with 53 per cent healed lesions resulting. When the growth originates on the ventricular band, radiation can succeed without surgery (Coutard). This lesion is more radiosensitive. Coutard states that for certain localizations in the hypopharynx and larynx and for certain stages of development, an almost constant success may be expected from radiation.

Recently Martin and McNatten (1934) reported 14 patients with carcinoma of the pharynx, tonsil and extrinsic larynx treated by divided doses of external irradiation. Forty-one (29 per cent) remained free from disease from one and three-fourths years to two and one-half years.

*Microscopic Grading.*—In Blair's cases operated radically he obtained the following results according to microscopic grading: Grade I—50 per cent five-year cures, Grade II—53 per cent, Grade III—40.7 per cent, and Grade IV—23 per cent. In his cases the prognosis seemed to depend upon the grade only to a slight extent. On the other hand, Lund in summarizing the cases at the Collins P. Huntington Hospital and the Massachusetts General Hospital found that the grading of the tumor was of considerable importance. Simmons in 100 graded cases found the following:

| | | |
|---|---|---|
| Group I | 30 cases | 20 (66%) cures |
| Group II | 31 cases | 11 (34%) cures |
| Group III | 24 cases | 2 ( 3%) cures |
| Group IV | 15 cases | 0 ( 0%) cures |

In Group IV he had no cures and in Group I the highest number, 66 per cent. He concluded that the grade of the tumor was the most important factor in the prognosis.

In Fischel's cases of buccal carcinoma the following was found according to grade:

| | NO. OF CASES | FIVE-YEAR CURES | GRADE OF CA. NODES |
|---|---|---|---|
| Grade I | 2 | 1 (50.0%) | |
| Grade II | 54 | 12 (22.0%) | 37 ( 68.5%) |
| Grade III | 46 | 7 (15.2%) | 36 ( 78.0%) |
| Grade IV | 5 | 1 (20.0%) | 5 (100.0%) |
| Not graded | 5 | 1 (20.0%) | 2 ( 40.0%) |

It is of interest that one patient in Group IV lived five years, but 5 with metastatic glands graded in Group IV lived five years and that the percentage was 100 per cent.

Lund in a review of 650 carcinomas of the buccal mucosa excluding lip and tonsil found that studies of the pathologic index of malignancy of carcinoma of the buccal cavity are of definite value. Two separate observers studied his material under unbiased conditions, and both arrived at approximately the same conclusion—a reaffirmation of the importance of the pathologic index of malignancy as one factor to be considered in the complete study of carcinoma of the mouth. The first observer (Simmons) found Grade I—49 per cent cured, Grade II—19 per cent cured, Grade III—7 per cent cured. The second observer (Warren) found 36 per cent Grade I cured, 21 per cent Grade II, and 0 per cent Grade III.

*Results as to Permanent Healing of the Local Lesion After Radium Therapy With Primary Healing.*—The results of Cade (1931) are of interest as to permanent healing of the local lesion after radium therapy. In 126 out of 169 of his cases the local lesion was healed by radium, but in 43 (about one-third) eventually local recurrence appeared. Berven both irradiates and excises the local lesion with the diathermic knife. This along with bloc neck dissection probably explains Berven's good results.

At the Radium Institute, London (1925 to 1929 inclusive), a considerable number of advanced cases are seen; 111 out of 154 had metastasis to the regional nodes. These cases were reported by Ward and Smith in 1933. In 116 instances the primary growth disappeared for the time being; 78 out of 116, however, showed a recurrence of the primary growth later; 4 of these patients survived five years, 6 for three years, 13 for two years. 47 for one year, 38 for six months, and 49 patients failed to survive six months.

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# BILATERAL CONGENITAL CARTILAGINOUS REST IN THE NECK*

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IN THE earliest literature that is available, reports of congenital anomalies of the head and neck are found. These anomalies remained unexplained until 1825 when Rathke did considerable work on the development of the head and neck from the embryonic branchial system. Since that time other men have carried on research in this field, and we are now better able to understand the origin of these anomalies.

The branchial system is of interest to the oral surgeon, since many of the important structures of the face and neck are derived from it. This system consists of five arches separated by four clefts or grooves which are formed in the neck of the embryo during the first two weeks of life. The whole structure corresponds to the arches and gills of the fish, but in man they further develop into important structures of the head and neck. The first arch or mandibular arch develops and differentiates into the upper short process forming the nasomaxillary bones, and the lower process forming the mandible and the floor of the oral cavity. Other bones and muscles are formed from the remaining arches, and various glandular structures are formed from the grooves after their fusion with the pharyngeal pouches.

Most of the anomalies of the face and neck are due to imperfect formation of the branchial arches and clefts. The commonest defect to be found in the neck is the lateral fistula or cyst. One of the rarest defects is the presence of cartilaginous remains in the neck. Matthews† reports a recent case. He has carefully gone over the literature and finds that there have been seventy to eighty cases reported, most of these by European writers.

In the cases reported, the cartilaginous bodies have been of various size, from that of a small seed to the size of a pigeon egg. They have been of various shapes. Upon palpation their hard consistency is noted. They have never been attached to the overlying skin nor to the muscles beneath them, but occasionally are attached to the deep fascia of the neck. In the majority of the cases the microscopic examination of the tissue shows it to be fibrocartilage. Matthews' case was elastic cartilage. Only one other case was reported as elastic cartilage.

In a few instances these cartilaginous remains have existed in common with lateral fistulas or cysts, and in a few instances within the wall of the cyst. Because of this relation it has been assumed that they have the same origin, both being due to a defective development of the embryonic branchial system. The fistula is interpreted as the persistance of a branchial cleft, and

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†Matthews: Arch. Surg., January, 1932.

the cartilaginous body as a remaining segment of a branchial arch. The question has never been settled as to which arch and which cleft remain as the anomaly.

The relation between the congenital cyst of the neck and the cartilaginous remains is further shown in the following case of bilateral branchial genetic cysts, each having a cartilaginous body at its base. There are a few cases reported in which congenital cartilaginous rests have been bilateral, and a few cases in which a lateral cartilaginous rest has been in common with a branchial cyst, but I am unable to find a report in which both are bilateral. I feel sure that this finding is rare.

### CASE REPORT

*History.*—Male, white child, aged six years, was brought to the clinic because of nodules on both sides of the neck. These had been present at birth. The family history was negative. The birth of the child was normal. He was

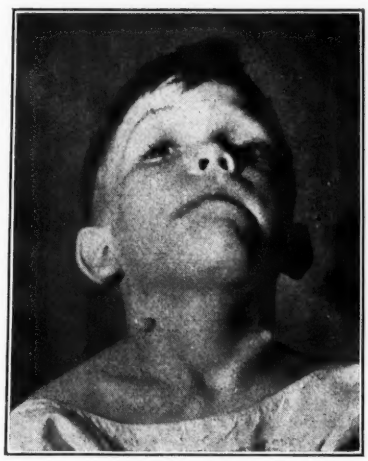

Fig. 1.—Preoperative appearance of the child showing the bilateral cysts with a cartilaginous rest at the base of each.

breast fed, had never been sick except for a few attacks of tonsilitis. The nodules on the neck were about the size of a walnut. They had never given the child any trouble, were not painful, and had never interfered with the movement of the head nor with swallowing. The mother was advised to have them removed shortly after the child was born.

*Physical Examination.*—Fairly well-developed white male child. Tonsils hypertrophied. Upon the neck were two symmetrically bilateral nodules, each about the size of a walnut. (Fig. 1.) These were round and could be collapsed. At the base of each nodule a hard irregular body could be palpated, each measuring about 2 cm. long and 1 cm. wide. They were located on the anterior border of the sternocleidomastoid muscle about midway between its two ends. The overlying skin was normal.

*Laboratory Findings.*—Blood count and urinalysis were normal. Wassermann negative. X-ray pictures revealed normal development of the cervical and thoracic vertebrae.

*Diagnosis.*—Bilateral branchial genetic cysts in common with bilateral cartilaginous rests in the neck.

*Operation.*—Under ether anesthesia the cysts were excised and the cartilaginous bodies dissected. They were not adherent to any structures. Grossly these bodies appeared as pieces of bluish white cartilage, about 2 cm. long and 1 cm. wide. Recovery was uneventful; the child left the hospital on the fourth postoperative day.

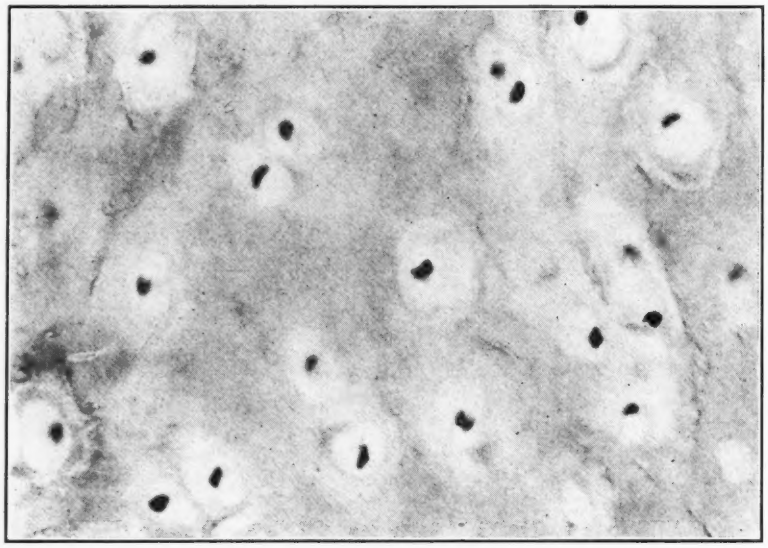

Fig. 2.—Microscopic appearance of a section of the cartilaginous rest. Stained with hematoxylin and eosin.

*Microscopic Examination of the Cartilage.*—Sections were made transversely through the specimen and were stained with hematoxylin and eosin. They were found to be composed of diffusely arranged cartilage cells. (Fig. 2.) Fibrous tissue surrounded the cartilage. This showed no inflammatory reaction. The more mature cells were in the central portion, while peripherally the nuclei had more of a fibroblastic appearance.

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# PEMPHIGUS

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PEMPHIGUS is an acute or chronic cutaneous disease characterized by round or oval blebs of varying size, which arise from an apparently normal skin. The process is continuous and may be associated with mild or severe constitutional symptoms.

*Classification.*—The word pemphigus means blister. Pemphigus is a relatively rare disease. The dermatologist recognizes four of the following five types:

1. Pemphigus acutus—a fulminating type running a fatal course in a few weeks or months.
2. Pemphigus chronicus, also called pemphigus vulgaris—this is the most common form.
3. Pemphigus foliaceus—characterized by the formation of bullae followed by generalized exfoliation. A rare form.
4. Pemphigus vegetans—usually found primarily on mucous membranes; lesions on the skin appear later and differ from the chronic type in that the base of bullae becomes papillomatous or condylomatous around the genital, crural, and axillary regions. This is the rarest form.
5. Pemphigus neonatorum—a bullous affection of the newborn. This condition is not a true pemphigus, but probably of infectious origin and in relation to impetigo contagiosa.

*Symptoms.*—Pemphigus vulgaris, the most common form, is a slowly progressive and usually fatal disease. The bullae appear suddenly in crops, as superficial collections of fluid, tense or flaccid, varying from the size of a pea to the size of a walnut. The contents may be clear, yellow, sometimes slightly red, or somewhat cloudy. The wall ruptures easily, leaving a raw surface. There is, however, no areola of redness. The individual lesion may dry and heal without rupture, or may heal after rupture, in about ten days. The lesions occur on the face or trunk, but perhaps with some preponderance on the extremities. They may appear on mucous membranes, as in the throat. The denuded cutaneous lesions are sensitive but not particularly uncomfortable. The bullae may appear primarily in the mouth and involve the buccal mucous membrane, the soft palate, the uvula, the pillars, the throat, or the esophagus.

*Pathology.*—The bleb is the result of sudden effusion of serum from the corium into the stratum mucosum, resulting probably from a dilated state of the blood vessels. The tremendous outpouring of serum and the softness of the prickle cells themselves may explain the distended appearance of the blebs. There is apparently a complete absence of inflammation, and the blebs appear to arise from a normal skin or mucous membrane. The blebs are superficial and

flaccid, and are easily ruptured. Continued bleb formation and denudation may be followed by cicatrization of the mucous membrane of the conjunctiva, nose, mouth, and throat. Spontaneous exacerbations and remissions are characteristic of the disease.

*Oral Manifestations.*—Pemphigus is one of the many dermatologic conditions which may manifest itself primarily in the mouth. Prinz and Greenbaum,[1] in their recent book on diseases of the mouth, devote considerable space to a description of pemphigus, and I have referred frequently to this very excellent book in the following description of the oral lesions of pemphigus:

These lesions may be of any type and develop prior to skin lesions, simultaneously, or remain limited to the oral mucous membrane. Patients usually describe their lesions as "a small blister the size of a pea," which later ruptures. These blisters may appear in crops, as many as eight having been observed at one time. The bullae may last twenty-four to thirty-six hours during the early months, but as the disease becomes more chronic, the bullae may not last an hour, and it becomes difficult to see them prior to rupturing. It is necessary to see a patient several times a day in order to recognize a bulla prior to rupturing. The initial blebs may be located on the pillars, the pharynx, soft or hard palate, lips, or any part of the oral cavity may be affected. The contents of blebs are serous and may be blood streaked. The blebs usually arise suddenly, are painless, flaccid, rupture easily from the least amount of trauma, leaving a red, congested area covered by a moist desquamated epithelium. The erosion usually heals in ten days, leaving a perfectly healed mucous membrane. New lesions continue to erupt and appear upon a perfectly healthy base. Nikolsky's sign (excessive sensibility of the skin with loss of the superficial layer on receipt of a slight injury) can be elicited by stroking the mucous membrane.

*Diagnosis.*—A request sent to the American Dental Association for literature on pemphigus brought a reply that there is very little in the dental literature relating to pemphigus as it occurs in the oral cavity. Acevedo[2] concludes that "since pemphigus frequently begins in the mouth, the dentist is the first to see it, make an early diagnosis, refer the patient to the dermatologist and help to make the therapy more successful." It is within the province of the dentist to be acquainted with all disease manifestations in the entire oral cavity. The following excerpts briefly illustrate the seriousness of this condition and the importance of its early recognition.

Taylor[3] states that: "Pemphigus with its painful ulcerations in the mouth is most difficult to diagnose. The pemphigoid lesions are more painful; the bullae form and burst leaving a raw, red surface."

Stovin[4] says: "Pemphigus is of frequent occurrence, but since its first symptoms appear in the mouth, a description of its characteristic lesions should be described in this paper. The prognosis is bad."

Rosenthal[5]: "Pemphigus appears in the mouth of middle aged persons as bullae on the mucous membranes of cheek—occasionally on soft palate and tongue. Accompanied by fetor—painful deglutition and salivation—the bullae heal without scars and tend to recur."

Greenbaum[6] states: "In differential diagnosis of bullous lesions in the mouth, erythema multiforme, pemphigus, and dermatitis herpetiformis may appear solely in the mouth, and diagnosis be made difficult."

Fox[7]: "Pemphigus vulgaris occurs almost entirely in adults and seems to have a predilection for the Jewish race, especially those of Russian birth. Although there are no pathognomonic, clinical or laboratory signs, a progressive loss of weight and strength is suggestive. Eosinophilia is not of diagnostic importance. The phytopharmacologic test of Pels and Macht promises to be of considerable value, but is still experimental. Usually fatal in three to eighteen months."

Schroff[8] reports a case of a Russian Jewess, aged forty-nine years, with primary pemphigus of the mouth. She died several months later without presenting any skin lesions. He also states that in pemphigus "50 per cent of the oral mucous membrane lesions are primary."

Seal[9]: "Etiology obscure—treatment useless. A woman, aged sixty-seven years, edentulous—wore upper and lower dentures— first lesion on soft palate —ten days later lesions appeared on skin. Died five months after onset. . . . A man, aged sixty years, throat and tonsils subacutely inflamed. The tip of uvula, the anterior pillars and left side of the soft palate showed superficial ulcerations with a dirty, grayish membrane. Family physician made a diagnosis of diphtheria in spite of two negative cultures—smear for Vincent's was negative. A diagnosis of stomatitis was then made. Three days later a bleb appeared on the lower lip which rapidly ruptured and formed a superficial, ragged looking ulcer. A diagnosis of pemphigus was made before skin lesions appeared. Skin lesions appeared in two weeks, bullae first appearing on his chest and feet. The patient died after agonizing symptoms lasting six months."

Imperatori[10]: "A man, aged sixty-eight years, chief complaint was difficulty in swallowing for the past ten months. Esophagoscopy showed at the cricopharyngeus that the mucous membrane appeared as if covered with cobwebs."

Rubenstein[11] reported two cases, both men, one aged fifty-four, the other, thirty-nine; both Russian Jews. The first symptoms in both were lesions in the mouth following the removal of a tooth. One patient died in five weeks; the second still alive, but septic, and "death will probably result from the condition." Both patients had a characteristic odor of the breath.

Lapowski[12]: "B. S., a man, aged forty-four years, married, born in Austria, a tailor, was first seen August 8, 1921, with lesions on the lower lip, gums, soft palate and tonsils. The lesions were smooth red patches, some of which looked like burst bullae. The man disappeared from the clinic, and two months later was treated in other places for this condition, under various diagnoses. On March 7, 1922, he returned with bullae scattered on the entire body. The pemphigus lesions on the mucous membrane had been present for about two years without involving the skin. Nikolsky's sign was present."

The diagnosis of pemphigus from the oral diagnostician's standpoint must depend on the history of recurring bullae distended with serum, which arise

from a perfectly healthy mucous membrane, rupture easily, and heal within ten to fourteen days. The finding of the lesions should make one suspicious of the disease. In all such cases, a dermatologist should be consulted. The diagnosis, as a rule, is difficult because of the infrequency of the disease, the unknown etiology, the numerous other conditions which are manifested by vesicular lesions, and the negative laboratory findings. Salt retention is a feature of pemphigus. Nikolsky's sign may sometimes be elicited, and the Pels and Macht phytopharmacologic test may ultimately prove of value in the diagnosis of this disease. A knowledge of the diseases that may primarily or secondarily affect the mucous membrane of the oral cavity should enable one to make the proper differential diagnosis. The following excerpt would apply to the mouth as well as to the throat:

Barlow[13]: "The picture of pemphigus of the pharynx is not generally visualized by the nose and throat specialist when he considers the conditions that may bring a patient to him with the sole complaint of sore throat. Yet, the blebs first appear in the mouth and throat in 60 to 65 per cent of cases, and the patient consults the laryngologist primarily because of symptoms referable to the oral lesions. Because, at times, the lesion in the pharynx manifests itself only as a sore throat with scarring, the otolaryngologist may fail to recognize it as a clinical entity and may either diagnose it as a luetic manifestation or catalog it as some indefinite chronic disturbance."

Tuberculosis can be excluded by the history, examination of sputum, biopsy, and examination of chest. Luetic manifestations—by the other concomitant signs characteristic of this disease and blood Wassermann reaction. Malignancy—by the chronicity of the malady, glandular involvement, and constitutional changes. The blood picture makes simple the diagnosis of blood diseases that have manifestations in the oral cavity. Vincent's stomatitis is a frequent diagnosis for every lesion that involves the mucous membrane of the mouth. However, the appearance of the lesions, smear examinations, progress of the disease, and response to treatment should not make the differential diagnosis of Vincent's disease difficult. Herpes simplex, dermatitis medicamentosa, burns and scalds, erythema multiforme, and allergic reactions can be differentiated by the history, behavior of the lesions, and the short duration of these conditions. Dermatitis herpetiformis is a polymorphous eruption with a pronounced tendency to grouping, and the vesicles frequently form upon an inflamed base.

## CASE REPORT

This case is particularly interesting to the oral diagnostician because the patient first presented herself for examination and treatment in the office of a general dental practitioner. She was a Russian Jewess, edentulous. The lesions manifested themselves primarily in the mouth. The progress of the disease had been of a benign character for almost three years. The blebs had been confined to the mucous membrane over the hard palate. There had been no evidence of lesions elsewhere on the body during the entire progress of this case, and her general condition had never been affected.

Mrs. E. D., a sixty-one-year-old Russian Jewess, first came to me on Sept. 14, 1933, for treatment as she could not wear her dentures because of recurring blisters in the mouth of six months' duration. These blisters had been recurring at intervals of every four to five weeks for the past six months and would rupture after five or six hours, with a discharge of salty, reddish fluid. She had been having little discomfort, but could not wear her dentures, and stated that she would like to be cured as soon as possible so that she could have new ones made as her others had been worn for twenty years.

General examination—a well-nourished woman, 5 feet tall, weighing 116 pounds. Physical examination was essentially negative except for blood pressure reading of 165 over 95. Her skin was clear; examination of rectal and vaginal mucosa, conjunctiva, and nasal cavities showed no lesions. There were no palpable glands; throat was clear; there was considerable tonsillar tissue; tongue was smooth; labial and buccal mucosa was normal. In the upper left quadrant of the hard palate there was an ulcer, one-half inch in diameter, sharply demarcated, a slightly red irregular border, and covered with a dirty, white membrane. X-ray examination of maxilla and mandible showed no cystic areas, roots, or sharp bony margins. Urine was normal in color and specific gravity, no albumin or sugar, and sediment was normal. Blood Wassermann reaction was negative. After observation for several weeks, I saw two bullae, one-half inch in diameter, on upper left quadrant of hard palate, purple-blue color, distended and flaccid. A diagnosis of essential hypertension and probable pemphigus primary in the mouth was made. The seriousness of the disease was suggested.

She then consulted a number of physicians and visited the out-patient department of a large general hospital. In every case a diagnosis of trench mouth was made, and a mouthwash of sodium perborate was prescribed. The patient returned to me a few weeks later and was sent to the dermatology department of the Beth Israel Hospital where the original diagnosis was confirmed. At the hospital she was advised to take large doses of viosterol, one dram three times a day, and was given smallpox vaccination.

She returned to me in November rather discouraged. I advised her to be more hopeful; the least we could do would be to try various treatments. I saw her frequently during the year 1934 and up to October, 1935. A copy from my records of January, 1934, reads as follows: "There is no pain in the mouth when bullae are present. The bullae rupture in one hour if the patient gargles. If left alone, they will last six to ten hours before rupturing. The bullae recur every three to four weeks; there is usually only one present at a time. After rupturing, the ulcer is clean and has no odor; is covered with a whitish membrane, and the area looks as if scalded. There is a definite red border around the ulcer. When the bullae rupture, there is considerable pain and burning which interferes with eating and lasts from two to four hours. The mouth heals in ten to fourteen days, leaving a clean, healthy mucous membrane. The salivary flow is increased, especially in the morning, and is quite thick and ropy." This condition was constant during 1934; the picture remained the same, but the interval between appearance of blebs diminished, and

at times they appeared every three to four days, mainly confined to different areas of the hard palate. The patient stated that at times she had premonitory symptoms as a drawing feeling in the gums prior to bullous formations. Removal of the desquamated epithelial cover after rupturing of bullae rendered the mouth much more comfortable.

During the entire period of 1933, 1934, and 1935, her physical condition remained good and was certainly not affected by the oral condition. My records dated October 1, 1935, read as follows: "For the past month there have been no bullae formed. This is the first time since her first visit that the mouth has been entirely free of healing lesions or fresh blebs." Jan. 1, 1936: "The mouth is still free from all lesions. Dentures were constructed and are being successfully worn." At this writing, April, 1936, the mouth has remained clean although, unfortunately, the patient has suffered from a cerebral accident from which she is now recovering.

## TREATMENT

Kuner[14] states "that since the etiology of pemphigus is not clear, the therapy is at a loss in finding the correct point of attack. A relapse may be excluded only after observation extending over several years."

Ludy and Moore[15] report the uncomplicated recovery under massive dosage with viosterol of the six cases of chronic pemphigus occurring in their practice in the past two years. They state, "There is a possible connection between faulty nutrition and the incidence of chronic pemphigus." As much as 45 c.c. daily was administered.

The remedies advised at the present time are the Davis treatment (intramuscular injections of a hemostatic, every other day, and an intravenous injection of iron cacodylate on alternate days); alkalization, arsphenamine, neoarsphenamine or tryparsamide, arsenic in various forms, acetarzone and germanin, quinine, high colonic flushings daily, viosterol in large doses, a high vitamin highly nutritious diet, vaccines, foreign proteins, autohemotherapy, buttermilk, beta lactose sugar and intravenous injection of dyes, and calcium compounds.

Greenbaum[16] states "at present it appears to me that the most important factors in the treatment of chronic pemphigus are, first, early diagnosis and, second, the maintenance or the improvement of the individual's nutrition by diet."

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# PHOTOGRAPHY FOR DENTAL SURGERY

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THERE is a very wide field for photography in all branches of dentistry. In many instances a photograph should be made a part of a patient's record, and may be used as a study procedure, education of the patient, record of preoperative conditions and postoperative results and legal protection.

The preoperative and postoperative appearance is valuable to the dentist and to the patient.

Photography is of great practical value in presenting clinical cases and results to students, as well as in experimental work.

I am more particularly interested in its usefulness in oral surgery. It serves as a record in those cases in which there is some considerable risk to the operator in an operative procedure such as cellulitis, acute abscesses, fractures, and other lesions which may give a serious result or cause oral disfiguration. The legal aid here is quite material, as it helps in many cases to show exactly what the preoperative condition was when the patient presented for treatment. The patient or the family, in some instances, may forget this after a lapse of time. Photography is also very helpful in the instruction of students, and in lecture work to show the appearance of clinical cases that would be very difficult to obtain in any other way. Plain and colored prints of these cases which occur in daily practice are most useful in instructive work, and especially when saved over a period of years, so that unusual and striking cases may be presented at the proper time.

The great difficulties in the past with photographic work of the face and in the mouth, as far as the dental surgeon is concerned, have been the proper apparatus, the proper lighting facilities, and the proper photographic supplies.

Intraoral work calls for quick exposure with reflected light. Probably most of the photography has been done by dentists with various types of modified cameras or with the Eastman special camera for this purpose. Unless the dentist is very adept with photographic work and has had considerable experience, results are not uniformly good with these types of cameras on account of variation of light, distance, etc. The results have been better where only extraoral work was to be done.

For a number of years our x-ray technician, Mr. A. E. Alderman, has been experimenting with many types of apparatus, for both still and movie work. A few years ago he undertook a study of the problem and has made a number of improvements in lighting and the use of different camera lenses and plates in order to help us obtain suitable pictures. He finally designed and perfected a camera mounted in a metal receptacle with a flashlight bulb back of it, with a

series of mirrors upon the sides, giving the appearance of a large number of lights. The lens was adapted for close-up work, so that a small indicator was placed against the patient's face to obtain the correct distance and then dropped out of place, and the exposure made instantaneously (Figs. 1 and 2).

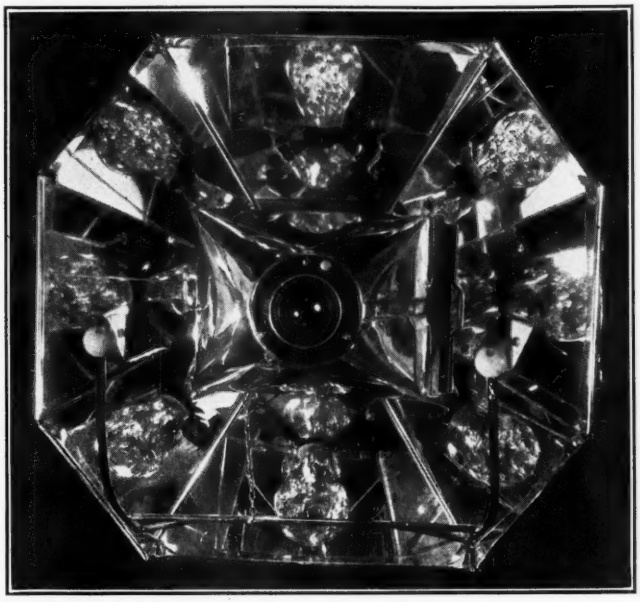

Fig. 1.—Front view of Alderman's camera.

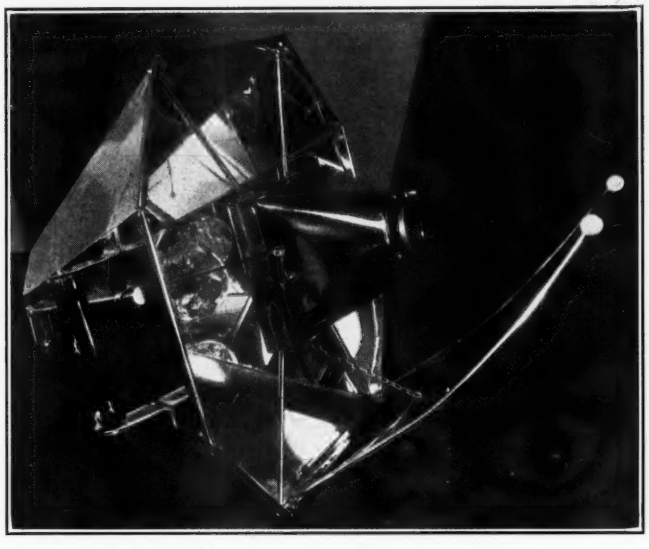

Fig. 2.—Side view of Alderman's camera.

The exposure is so rapid that pictures of the tongue can be made without any interference with slight motion. We have been able to get good pictures of the tonsillar region and any region in the mouth.

The particular advantage of this camera is the ease of operation, availability and the lack of necessity for extreme care in focusing.

This camera (Fig. 3) consists of a metal bowl-like reflector, with camera mounted centrally in front, and with flash bulb centrally behind the camera, which reflects light upon the object to be photographed from eight mirror reflectors.* Light is, therefore, reflected upon the object to be photographed from eight different angles.

The big advantage is its depth of focus at any distance between two and twenty inches. It has a depth of focus ten times as great as any other camera for outside work for this purpose. Another advantage is that there is a uniform exposure after you know the type of plate you are using. Just leave on that adjustment and exposure would be the same at all times.

It has an especial advantage in orthodontia work in that additional views can always be made under the same conditions, for instance, angle, light, etc.

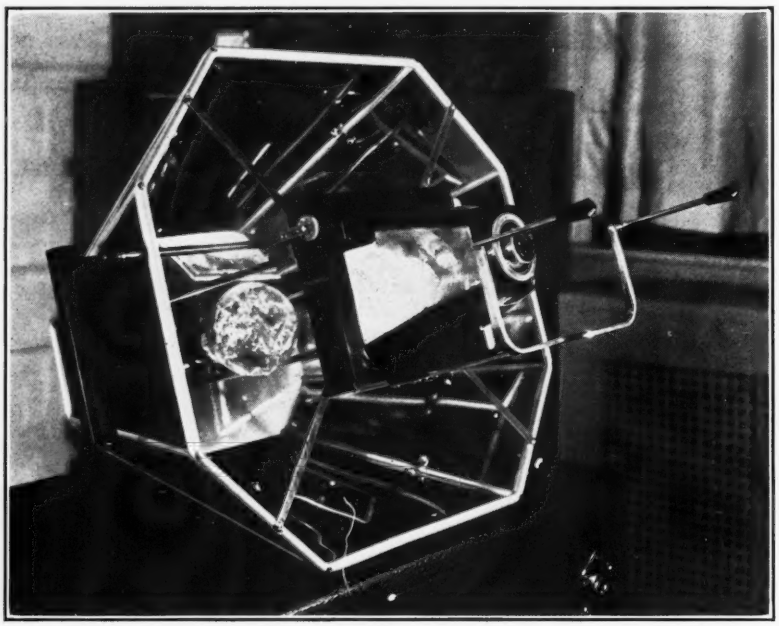

Fig. 3.—New Burton clinical camera.

The trigger that operates the shutter is also synchronized with the flash bulb so that when the shutter is fully open, the flash bulb ignites in 1/60 of a second, thereby eliminating all danger of movement of the camera or subject.

The camera has its own batteries located in the bottom of the reflector. When these batteries are used, it is necessary to use a flash-light bulb for each exposure.

The camera is also equipped with a socket permitting the use of photo flood bulbs where it is desired to use standard city current, in which event the same electric bulb may be used continuously.

The amount of light produced enables you to use black and white or any of the color processes.

*This camera with certain modifications is now being made by the Burton Manufacturing Co.

When making a black and white, it is very satisfactory to use the panchromatic cut film.

In using color process it is satisfactory to use Finlay process plates, Agfa plates, Autochrome plates or Dufay cut film.

### FINLAY COLOR PROCESS

The Finlay process color plates produce excellent mouth reproductions and have many advantages, such as the fact that any number of either black and white or color reproductions on either glass or paper may be made. This method requires photographic experience and careful attention to detail. The cost is somewhat of a disadvantage.

The cost of a finished plate with this method runs about $1.00 for color and about 20 cents for a black and white plate or print.

The Finlay process has been very satisfactory to us in the making of plates and especially lantern slide views. This is an English process; a special sensitized photographic plate is placed in a plate holder covered by an especially designed taking screen which has incorporated in it many small prisms which can be seen by holding the plate to the light. It will be observed that the plate holder must be deep enough to hold two glass plates, the photographic plate and the taking screen plate. This plate is exposed in the usual way and for outdoor work takes six times the exposure of the panchromatic film. This factor is of no particular consequence in dental surgery because the exposure is standardized for all these cases.

A Wratten and Wainwright Panchromatic special supersensitive plate* for use with the Finlay color process method or the Finlay plate is placed in the plate holder with the sensitive side up, and the taking screen is placed with the sensitive side toward this plate and on top of it. The cover is then placed on the plate holder. In this way both sensitive surfaces are together, and the glossy sides of the plates are downward and upward. This filling of the plate holder should be done in an absolutely dark room, and if any light is used at all, it might be a green safe light. These plates are extremely sensitive.

A special plate holder is used that holds two plates, one the photographic plate and the other the color taking screen. The color taking screen is very similar to the negative and must be handled very carefully, so as not to scratch it. In this way it may be used any number of times. These color taking screens for the 3¼ by 4¼ cost about 90 cents each. The plate, after being exposed in the camera, is developed as an ordinary negative. Any good x-ray developer may be used after being diluted about one-half with water in order to soften it. It is best to develop five minutes by time without safe light. If a safe light is used, it is best to turn it on for just a second or so to observe the plate. When the plate is finished, it is known as the negative. Any standard photographic plate is then placed sensitive side up and glossy side down in any ordinary plate holder used for photographic work.

This may be done under any darkroom safe light. The negative is then placed on top of the unexposed plate in the holder, the sensitive side downward

*Sold by the Eastman Kodak Co.

and the glossy side upward. The plate holder is closed and the plate then exposed to light. Expose positive approximately two seconds to a 20-watt bulb at a distance of ten feet. Another method we have used is to hold a safety match six to twelve inches from plate and let it burn out. This plate is developed either in the same solution used for the first negative or, in those cases where more contrast is needed, a softer developer is used, especially one put out by the Finlay people. Probably the best method of developing this positive picture is to use a pyrex glass dish in a box over a red light so that the plate may be watched during development. When this second plate is developed and finished, it is known as the positive plate; and, after it has been finished, washed and dried, a special covering glass or viewing screen made by the Finlay people, which is similar to the taking screen, is placed over the plate until color squares are registered and color is normal. The plates are then held together with a large clamp and bound with tape. The greatest advantage is that after the negative is made, it can be filed and from it as many positive plates can be made as desired. The plates can be made as ordinary black and white, and these black and white positives may be also used as color plates by simply placing a color screen upon them. Black and white prints may be made or colored prints may be made by sending the negative to the Finlay people.

# MAKING PHOTOGRAPHIC RECORDS OF CLINICAL CASES

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SEVERAL articles have appeared recently on clinical photography in dentistry, orthodontia and oral surgery. Among others may be mentioned those of Lischer,[1] Maller,[2] Golden,[3] Dunn,[4] Nelson,[5] and Mead.[6] All of these describe the use of the camera for a standardized office technic in duplicating results under identical conditions of light and distance. All of them have the drawback of not being easily portable. When one's practice consists of office cases alone, some form of fixed apparatus is highly desirable, but in surgical practice, when patients may be seen in the hospital or the home as well as in the office, the value of many interesting and unusual cases is lost as far as teaching and recording in the literature are concerned, just because it is not convenient to make photographic records at the time they are seen. By the time the camera can be obtained, the opportunity may be lost. Therefore, it is very desirable to have apparatus not only adaptable to the fixed focus and lighting technic, but also ready to make a record at any time no matter where the case is seen, whether it be in the operating room, in the hospital ward, or in the office. Obviously, many otherwise excellent cameras, with their accessories, are far too bulky to be carried about all day and every day. The ideal camera for this purpose must possess certain essentials. It must have very little bulk and be light in weight so that it can be carried everywhere in a handbag or the pocket, to be instantly available on all occasions. It must have a fast lens, so that instantaneous snapshots may be made under average lighting conditions. It must be economical to operate. These conditions are fulfilled by the modern miniature camera, with a lens not slower than f 3.5, which will make a satisfactory negative in $\frac{1}{20}$ second with the light of the ordinary hospital operating room. These cameras use 35 mm. or standard cinema film in rolls giving 30 to 36 exposures to a roll. If purchased in 25- or 50-foot rolls and cut into lengths as required to load the camera, each negative will not cost more than one cent. In my handbag I carry the following equipment: the camera, a No. 2 front lens for close-ups, a sliding focusing copy attachment, which may also be used for close-ups, a small folding tripod with universal joint, a stereoscopic slide-bar, a photo-flood light in a small portable bedroom clamp lamp, and a Weston exposure meter. The space and weight of these in the handbag are negligible. It is also desirable to have a second camera loaded with Dufay film in case it is advisable to have a color record as well as black and white. The folding tripod may be used when exposures longer than $\frac{1}{20}$ second are necessary or when stereoscopic pictures are made by use of the slide-bar. From the small negatives enlargements on paper can be made to any desired size for adding to the patient's record or for publication. Positives can be made on film strips or on regular lantern slides for projection. Contact positive films can be made from the negatives

taken with the stereoscopic slide-bar, placed in cardboard mounts backed with celluloid, and viewed through a small hand stereoscope by transmitted light. With the focusing copy attachment and a special stand to hold the camera vertically, one is able to make reproductions of pathologic specimens or other objects connected with the cases, either singly or stereoscopically. Very satisfactory photomicrographs can also be made by placing the camera lens directly over the eyepiece of the microscope. An excellent article on this phase of the work has been recently contributed by Pilcher.[7] Large x-ray films can be readily copied by placing in a large viewing box and photographing with the camera by transmitted light. In the office or the clinic, where the camera is most used, it is convenient to have a rigid stand such as those described by Dunn[4] and Golden,[3] to which the camera can be attached in such a position as to be focused conveniently on the patient.

To sum up, we have in the miniature camera and its accessories, compact, easily portable apparatus for obtaining all sorts of photographic records of cases, conveniently made at the time we most want them. It is truly an emergency outfit.

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# Department of Orthodontic Abstracts and Reviews

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**Biologic Orthodontic Treatment in Theory and Practice** (Biologisch-orthodontische Therapie und Wirklichkeit). By Prof. Dr. Albin Oppenheim, Vienna, 1936, Urban & Schwarzenberg.

### BIOLOGIC TREATMENT

Despite the claims of orthodontists belonging to the Mershon school, the experiments which are here discussed prove that a strictly biologic treatment in orthodontia does not exist. Injuries to the tissues cannot be altogether avoided, though they can be reduced to a minimum. Absence of pain and absence of mobility are the criteria for the avoidance of extensive damage to the tissues. The forces to be used must be gentle; they must act intermittently, with periods of rest intervening. This can be done only with the labial appliances and ligatures and not through the continuous pressure of the lingual appliance with auxiliary springs.

### METHOD OF EXAMINATION

All the teeth examined for this book belonged to human beings and were extracted after having been moved orthodontically by the usual methods. They were removed together with some of the surrounding bone, and they show conditions actually present in patients under orthodontic treatment. Labial appliances with and without auxiliary springs were used, and also lingual appliances. Some teeth were retained in their new positions for a time, while others were extracted without retention; some were allowed to relapse and were extracted afterward.

### REACTION OF THE ALVEOLAR BONE

The effect of orthodontic movement was studied primarily with regard to the four tissues mainly involved: bone, cementum, peridental membrane, and pulp. The findings on human material are not in all respects similar to those on dogs. The bone reacts to the increased pressure of orthodontic treatment with resorption, depending in extent upon the intensity and the duration of the pressure. The resorption is always most marked near the alveolar border and leads to a lowering of the alveolar crest. According to the time interval between the last adjustment of the appliance and the removal of the tooth for examination, more or less pronounced signs of repair of the bone resorptions are noticed. The osteoclasts gradually disappear, and the resorption cavities become lined with osteoid tissue. Contrary to the experimental

evidence on monkeys (Oppenheim) and dogs (Gottlieb), new bone formation on the opposite side of the alveolar plate (in the direction of movement) hardly ever occurs in man. This safeguard to prevent thinning out of the alveolar plate in the direction of the moving tooth is therefore lacking. In labial movement, we notice that the labial alveolar plate becomes often as thin as paper and the alveolar crest becomes as sharp as a knife's edge. On the side of the tension, osteoid bone is formed in even layers if intermittent forces are used. Continuous forces, however, seem to produce osteoid bone in a more irregular, trabecular form.

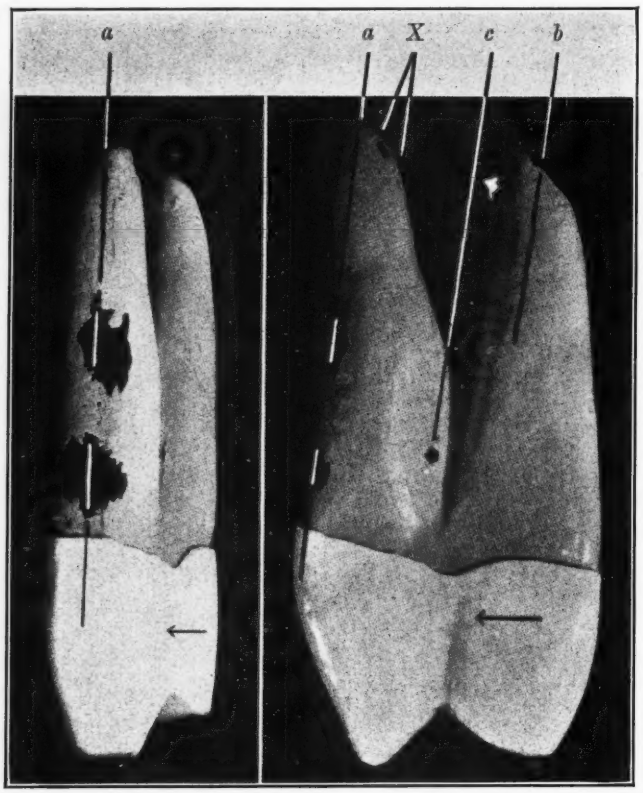


Fig. 1.—*A*, Buccal view; *B*, distal view. Maxillary left premolar; labial movement (in direction of arrow) by means of labial arch and ligatures; adjustments every one to two weeks. *a*, Resorptions on the buccal side, the lower one deeper than the upper one; *b*, resorptions on the lingual side, near apex due to excursion of apex in opposite direction; *c*, resorption on the distal side, due to a change in the direction of the force.

### REACTION OF THE CEMENTUM

Under physiologic conditions, as they occur in the natural growth processes of the jaws, we notice that cementum is more resistant to resorption than bone. For in those truly biologic movements of the teeth due to growth and development, extensive changes in tooth positions occur without any damage to the cementum. Such a "biologic" movement cannot, however, be imitated by orthodontic appliances. For this reason, resorption of the cementum in places of increased pressure remains a concomitant phenomenon of tooth movement. Intermittency and constancy of the force have not much effect on it; these are solely dependent upon the intensity of the force applied.

Severe injuries are caused if the forces exceed the permissible compression of the peridental membrane. The extent of cementum resorption is greater the stronger the force applied, the longer the duration of its action, and the more frequent the change in its direction. Under the influence of extremely strong forces, resorption of whole root portions occurs, and even perforations into the pulp canal. (It may be mentioned in this connection that all authors who examined human teeth after orthodontic movement have, without exception, reported cementum resorptions.) Despite the fact that in most instances

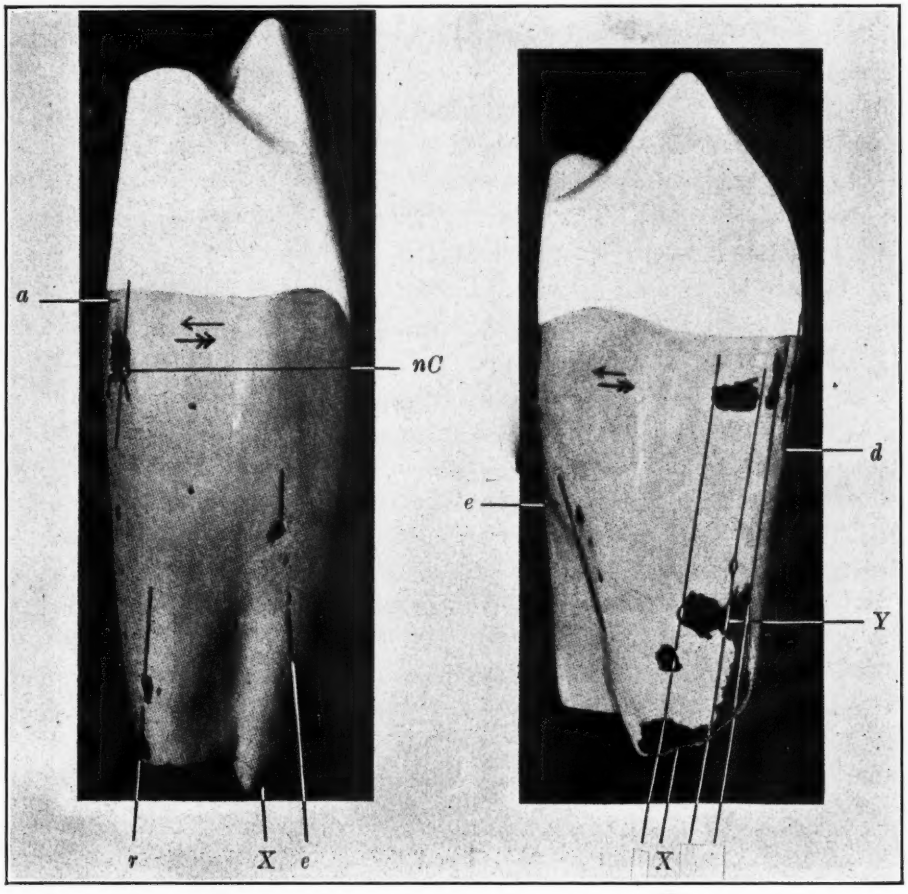


Fig. 2.—*A*, Mesiolingual view; *B*, mesiobuccal view. Mandibular left premolar; lingual movement (in direction of single arrow) by means of an auxiliary spring. Later on the tooth was allowed to move buccally again into its old position (in direction of double arrow). Both movements produced resorptions. *a*, Resorption on lingual side near alveolar border (due to lingual movement); *nC*, island of cementum remaining intact within the resorption; *X*, resorption on buccal side near apex (due to lingual movement); *Y*, deepest portion in resorption area *X*; *d*, resorption on labial side near alveolar border (due to labial movement); *r*, resorption on lingual side near apex (due to labial movement); *e*, resorption near bifurcation of the roots (due to changes in the direction of the force).

repair of the resorption takes place in the form of deposition of secondary cementum, it is questionable whether this repair is ever complete. Sometimes a disturbance of the odontoblasts of the pulp has been described (S. Fischer) in areas opposite cementum resorptions. In the majority of instances, however, a strong tendency to recovery is noticed with cementum resorptions, occasionally even leading to an excessive deposition of cementum (hyperce-

mentosis). Repair of the resorption starts immediately after the intense force has ceased acting, but its progress and final outcome depend upon individual reaction. The location of the resorption in the cementum is, if labial movement was attempted, on the labial side near the alveolar border and—if tipping of the tooth occurred—also on the lingual side of the root near the apex. Resorption defects in the cementum cannot be demonstrated by the roentgen examination, not even if they are located on the mesial or distal sides.

### REACTION OF THE PERIDENTAL MEMBRANE

During the compression of the peridental membrane under the influence of orthodontic force, a change of its structure occurs which may be likened to the formation of a pillow. The substance of the pillow consists of intertwining blood vessels which produce the appearance of an angioma. Under pressure, the vessels of the angioma are emptied, much in the way a sponge is emptied under compression. Such a "pillow" is formed only if the vitality of the membrane has not yet suffered too much, namely, if weak and intermittent forces are being used (other authors consider the formation of angiomatous masses not as nature's bulwark against compression, but as a result of stasis). It is an often stated and generally accepted fact that the peridental space is—during tooth movement—narrowed on the side of pressure and widened on the side of tension. A very small difference in breadth is noticed even in the genuinely "biologic" movements of teeth due to growth and development. However, if the difference exceeds moderate amounts, and reaches, as in some cases, 50 per cent of the whole peridental width, it becomes an indication of too rapid and unbiologic treatment. In contrast to these usually reported findings, several teeth of the present examinations show the width of the peridental membrane slightly greater on the side of pressure. This may possibly be due to a resorption exceeding the required amount, or due to an endeavor of nature to diminish the pressure in a quick and long lasting manner. These various disturbances of the peridental membrane seem, under ordinary circumstances, to be repaired again; clinical experience also shows that teeth which have been loose and sensitive again become firm and strong.

### REACTION OF THE PULP

Due to its enclosure in a rigid form and due to the lack of collateral blood supply, the pulp constitutes one of the most sensitive tissues of the human organism. The slightest movement of the apex must necessarily lead to a pull on the pulp vessels which in turn causes hyperemia and stasis. Further results are serous exudation into the tissue, the formation of vacuoles, and hemorrhages. The normally even arrangement of the odontoblasts has then disappeared, and their function is interfered with (as expression of which fact wider, uncalcified dentin layers are formed). The formation of multiple denticles (pulp stones), which were noticed in three instances, is possibly another result of the changed function of the odontoblasts. (Two cases of complete calcification of the pulp due to orthodontic measures have been reported in orthodontic literature.) The final fate of the pulps which have suffered

such damage is not known. According to some authors, the damaged pulps heal when the blood circulation improves; others report severe disturbances and death of the pulp after orthodontic treatment. The extent of damage appears to be in direct proportion to the rapidity of the movement. In any event, the power of regeneration of the pulp tissue must be much greater than commonly accepted. Despite the severe disturbances which are noticeable in nearly all the teeth examined (and which must be even more extensive after a long duration of the treatment), clinical experience with moved teeth forms, fortunately, a pleasing contrast to these histologic findings.

CENTER OF ROTATION IN TIPPING MOVEMENTS

If very gentle intermittent forces are used for a short time (ten weeks), indications of a movement of the apex in the opposite direction cannot be seen in the histologic slide. The center of rotation, then, must be assumed to be at the apex, and the action of the tooth may be compared with a one arm lever. If the treatment exceeds ten weeks, the apex always moves in the direction opposite to the application of force (two arm lever). In order to avoid such a reaction, it would be necessary to interrupt treatment after that time, and interpose a period of rest. If tipping occurs on newly erupted teeth, the root formation of which is not quite completed, deflections and deformations of the root-end result. No root-end resorptions were found in any of the teeth examined, regardless of the fact that they were treated with labial or with lingual appliances. The reason that lingual appliances clinically produce less root-end resorption than others (Ketcham) is not due to the fact that they act more biologically, but that they allow more jiggling of the tooth because of their failure to hold the tooth firmly during the movement. Occlusal pressure or mastication of food is sufficient to deflect the springs temporarily and to allow movement of the tooth. The tipping of molars in such cases where auxiliary front springs are used, adds to the jiggling because every occlusal contact on the tipped molar tends to force it back into its original position, thereby moving the front part of the appliance continually upward and downward. These movements bring about strong excursions of the apex and therefore an extensive widening of the peridental space around the apex. It is these wide spaces which save the root-end from resorption, while other parts of the root are subjected to more severe disturbances than they would be otherwise. Therefore, it is not true that the more biologic action of the lingual appliances is responsible for a smaller percentage of root resorptions.

In order properly to evaluate Oppenheim's book it is necessary to separate his histologic findings from his interpretation of them. There is no doubt that his histologic examinations of human teeth after orthodontic movement represent a major contribution to our science. Their value can hardly be overestimated because of the serious difficulties connected with this type of research work, because of the labor, patience, and knowledge involved to carry it out.

The most startling finding is the difference existing between human and animal teeth, which up to now has hardly been suspected. The alveolar bone

of the animal maintains its thickness during tooth movement by new bone formation on the outer surface of the labial (or lingual) plate. The human tooth shows only very indefinite rudimentary attempts to new bone formation and, as a result, is being thinned out alarmingly. If the alveolar crest recedes in this thinning-out process, it is probably a permanent recession because we know from periodontic studies that it is practically impossible to rebuild a broken down alveolar crest. There is, furthermore, the danger that the gum tissues eventually follow the bone in its recession.

A further surprising fact is the number and the extent of resorptions visible on the root surface. They are to be found in practically all the teeth examined—regardless of the appliance used and regardless of the duration of the treatment. True, the resorptions tend to repair quickly if given a chance, but it is questionable whether the root surface ever again resumes its original contour and vitality. Another serious consequence of orthodontic movement seems to be the effect upon the pulp, the stasis occasioned in the pulp vessels, the disturbance of the odontoblastic layer, the final necrosis occurring sometimes many years after treatment is completed. What then, should our attitude be in the face of such serious injuries suffered by vital tissues during tooth movement? Should we abandon all further attempts to regulate teeth by means of mechanical devices? Should we give up orthodontia confronted by such overwhelming scientific evidence of damage and injury to the tissues?

If Oppenheim's article had been written a few decades ago, it would have meant a stunning blow to orthodontia. Today, fortunately, we possess sufficient clinical evidence obtained during and many years after treatment to alleviate the greatest part of our fears. Even if we suppose that in a completed case the mouth is not in an entirely healthy and physiologic condition, even if we admit certain injuries to the tissues, we still must ask these questions. In what condition was this mouth before treatment? In what condition would it have been without treatment? Teeth which are misplaced and which bite incorrectly are subjected to the damages of traumatic occlusion and of non-occlusion. Histologic examination of their tissues shows thinning of the alveolar bone, recession of the crest, resorption of the cementum, inflammation of the peridental membrane, and disturbances of the pulp. Many of these teeth are later lost—many more of them, no doubt, than are lost after orthodontic treatment.

But even if we do not accept the extremely pessimistic viewpoint, we must accept the evidence presented as a renewed warning—after so many others sounded recently—to carry out our treatment with the utmost consideration of biologic laws. It is at this point that it becomes difficult to follow the author's reasoning.

He demands that—as long as a strictly 100 per cent biologic method does not exist—the next best method should be utilized. And the next best method, in his opinion, is the gentle "intermittent" force; in terms of appliance design: the labial expansion arch with its ligatures. Movement with this appliance shows fewer injuries to bone, cementum and pulp than the movement with the "continuous" force of the lingual appliance with its auxiliary springs. According to Oppenheim, labial appliance is, therefore, synonymous with

"intermittent," lingual appliance with "continuous" force. It is obvious that this is a highly generalized and, consequently, misleading statement. If we interpret that "intermittent" means pauses between applications of force (during which there is no pressure on the tooth) and that "continuous" means pressure over a long period of time without pauses, it becomes obvious that both types of adjustment may be carried out with either appliance; that it depends entirely upon the individual operator which method he wishes to employ. It is, after all, the elasticity of the wire which is utilized as force in both appliances. In molar expansions, for example, a 19 gauge labial or lingual arch may be adjusted with, let us say, one-sixteenth of an inch activation. Both arches will act upon the same teeth (one from the labial, the other from the lingual side) in a mechanically identical manner, and they will move the molars in the same length of time the same distance. Where does the intermittency or the continuity of the movement come in? If an activation in the incisor region is made to the extent of $\frac{1}{16}$ inch, and in one instance the incisors ligated to the 19 gauge labial arch, in the other pushed by a 24 gauge auxiliary spring, the heavier labial arch will move them into position quicker than the thinner spring, but the intermittency or the continuity would entirely depend upon the time of the subsequent adjustments. If the operator of the labial arch adjusts his appliance in very short intervals, before the wire can assume its passive state, the incisors are subjected to a continuous force. If the operator of the lingual arch makes his adjustments in very long intervals, the incisors will be moved with intermittent force, because, after assuming their new position, there would be a pause before the next adjustment came.

Strictly speaking, no orthodontic force is continuous in duration and extent because at the beginning of the adjustment the elastic force of the wire is greater than later on when it has worked itself out by traveling toward its passive position. The only reason why Mershon has called the force of his auxiliary springs continuous is that the 24 gauge wire will take more time to come (together with the tooth) to its passive position than will the heavier 19 gauge labial wire. But as Mershon, at the same time, demands longer intervals between adjustments (pauses before the passive spring may again be activated) his force is also intermittent. Of course, we might now reverse our example. Suppose the labial arch were adjusted only in long intervals—the subsequent adjustments made only considerable time after the incisors had assumed their new position $\frac{1}{16}$ inch away from their original place —that would be intermittent force; and suppose the lingual spring were adjusted in very short intervals before it had a chance to become passive—that would be continuous force.

The difference in Oppenheim's findings of cementum resorption, etc., cannot, therefore depend upon the intermittent or the continuous force of the appliances themselves—but upon the manner in which Oppenheim has adjusted them. When using the labial arch he employs more or less standardized methods. The lingual arch and the auxiliary springs, however, he uses in a manner so different from that suggested by Mershon (and most commonly followed in this country) as to make comparison impossible. This becomes

evident by Oppenheim's own statement that it was impossible for him, despite several attempts, to use the same auxiliary spring for several months, because it would break, bend, or slide off the tooth.

Furthermore, in two of the four experiments with auxiliary springs, the springs were less than 3/8 inch long; these can hardly be called springs but are merely spurs and represent a very rigid, strong and unyielding force. Another time a closed spring (as suggested by A. M. Schwartz) was used. This spring, soldered to the arch wire on both ends, should be considered a dangerous innovation of auxiliary spring design on account of its rigidity. Under the circumstances, it is not surprising that the auxiliary spring appliance caused greater injury than the labial arch, which with proper usage would never have occurred. For, does not the auxiliary spring method fulfill, to the fullest extent, the demand which Oppenheim himself calls the "only criterion" for not causing undue injury to the tissues, namely, lack of pain and mobility? One cannot help feeling that Oppenheim is somewhat prejudiced against appliances with auxiliary springs. He even takes away their credit for causing less root-end absorption than other appliances, a fact which was statistically proved. His explanation that the jiggling of the tooth against the yielding spring causes wide excursions of the apex, thereby resorbing the bone and safeguarding the root-end, cannot be reconciled with his statement that the injuries found near the alveolar border are the more severe. If wide excursions of a jiggling tooth cause extensive bone absorption around the apex, then the same excursion must cause similar absorptions at the alveolar border —safeguarding the root also at this place against resorption. How can a tooth tip to the extent that its apex moves in one direction without its alveolar portion moving in the other direction?

It is regrettable that it was not feasible to employ, for Oppenheim's experiments, auxiliary spring appliances which represented more nearly authentic conditions of design and usage. As this was not done, it may only be hoped that Oppenheim's latest findings be accepted as examinations of teeth moved by the author with appliances designed and adjusted by himself, and without generalized conclusions to other appliance designs in the hands of other operators.

*E. N.*

# International Journal of Orthodontia and Oral Surgery

PUBLISHED THE FIFTEENTH OF EVERY MONTH BY

THE C. V. MOSBY CO., 3523-25 Pine Blvd., St. Louis, Mo.

**Foreign Depots**—*Great Britain*—Henry Kimpton, 263 High Holborn, London, W. C.; *Australasia*—Stirling & Co., 317 Collins Street, Modern Chambers, Melbourne; *India*—"Practical Medicine," Egerton Street, Delhi; *Porto Rico*—Pedro C. Timothee, Rafael Cordero 68, San Juan, P. R.

**Subscription Rates**—Single Copies, 75 cents. To any place in United States, Cuba, Porto Rico, Canal Zone, Mexico, Hawaii and Philippine Islands, $7.00 per year in advance. To Canada, $7.50; under foreign postage, $8.00. Volume begins with January and ends with December of each year.

**Remittances**—Remittances for subscriptions should be made by check, draft, post office or express money order, payable to the publishers, The C. V. Mosby Company.

**Contributions.**—The editor will consider for publication original communications of merit on orthodontic and allied subjects, which must be contributed solely to this Journal. Original, double spaced, typewritten copy should be submitted.

**Opinions**—Neither the editor nor the publisher holds himself responsible for the opinions of contributors, nor are they responsible for other than editorial statements.

**Reprints**—The publishers will communicate with authors regarding reprints upon publication of papers.

**Communications**—Contributed articles, illustrations, letters, and all other matter pertaining to the editorial department should be addressed to the editor, Dr. H. C. Pollock, 4482 Washington Blvd., St. Louis, Mo. All communications in regard to advertising, subscriptions, change of address, etc., should be addressed to the publishers, The C. V. Mosby Company, 3523-25 Pine Blvd., St. Louis, Mo.

**Illustrations**—Such half-tones and zinc etchings as in the judgment of the editor are necessary to illustrate articles will be furnished when photographs or drawings are supplied by the authors of said articles.

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**Nonreceipt of Copies**—Complaints for nonreceipt of copies or requests for extra numbers must be received on or before the fifteenth of the month of publication; otherwise the supply may be exhausted.

Entered at the Post Office at St. Louis, Mo., as Second Class Matter


# Editorial

## A Health Service Plan Successfully Directed by Physicians and Dentists Themselves

"There is a growing belief that the proponents of compulsory sickness insurance are preparing to enter upon a campaign again at the coming session of Congress. Senator Wagner, a close adherent of the administration and friend of the president, has so stated."*

Some form of regimented practice to provide adequate health service for the low-income groups of the people is an urgent necessity; likewise it is important that the direction, the policy and the operation of such service be left

*A.D.A. Committee on Economic, Quoting, John T. Hanks.

in the hands and control of the health professions. The world is rapidly becoming conscious of the wreckage of derelict health service plans started in various countries, controlled by politicians and operated by laymen who do not know good health service from the incompetent and inefficient variety. Excavations of these experimental plans and posthumous débris in various countries reveal indifferent and lethargic attention and interest on the part of the doctor in the operation of these health plans. The most convincing evidence, that gleaned from experience, now points to the obvious conclusion that for health service to be successful and efficient the doctor's spirit, drive and enthusiasm must not be snuffed out of existence by a system of political patronage, but that his ambitious cooperation should be preserved if any plan is to be successful for the people.

This question still remains entirely unanswered. What are the physicians and the dentists going to do about it themselves in guiding and directing the next big move? What are the health professions going to do to offset the possibility of the mistakes being made in America which have been made in foreign lands? The time for the professions to shrug shoulders and assume that the problem belongs to the future generation is past; some kind of regimentation is now on its way.

An American method is now being tried, which is quite successful in Washington, D. C., and in St. Louis, Missouri. The organization is called the Medical Economic Security Administration, and consists of three parts:

1. The medical-dental service bureau.
2. The group hospitalization service.
3. The central admitting bureau.

They are all incorporated as nonprofit bearing organizations. The important points of the plan are based on the fact that each individual in any community is a separate economic unit.

By the operation of this organization, the dentists and the physicians, through their respective societies, are prepared for any changes which might be recommended by either the federal or the state government with regard to the delivery of health service. Unselfishly, the allied professions have established a well-coordinated program which utilizes existing machinery and does not subject the community or the taxpayers to any additional expense. In making possible to every class, free choice of dentist, physician and hospital, the professions have not disturbed the patient-doctor relationship which is so vital to the recovery of the individual. The dentists and the physicians of Missouri have not sacrificed their individualism nor have they established a new experiment at the expense of the public.

The dentists and the physicians operating this plan are the first in this country actually to inaugurate group hospital service plans. Other societies have approved them after establishment, but professional leadership was evident in the societies taking the initiative. In the establishment of the Medical-Dental Service Bureau and Group Hospital Service and the eventual establish-

ment of a central admitting bureau for clinics, the professions doing this are giving to the community the leadership in matters of health that is expected of them. The field secretaries and the director of this economic project have addressed educational talks to approximately 100,000 people in employed groups, and to each of them has been brought the message that they should see their family dentist and physician without further delay. The importance of prevention has been stressed because the economic question has not been one that requires the utmost consideration any longer. In this educational work among the laity it has been pointed out that the services of the Medical-Dental Service Bureau were offered to them, making it possible for them to request of their family dentist and their family physician the privilege of using the society's bureau to budget needed health care over a period of months without additional cost.

In educational work for the plan, the director and the field secretaries of the Medical Economic Security Administration have addressed other groups, such as parent-teacher associations, civic organizations and the entire teaching staff of the public schools. In addition to the direct method, printed inserts carrying the same message have been delivered in pay envelopes to almost 200,000 workers.

In setting up a plan of coordination which makes it possible for the individual with low income to budget for dental or medical care and to enroll in a prepayment plan for hospitalization, the worker has been relieved of financial worry to a considerable extent.

Since the establishment of the Medical Economic Security program a number of unethical contract health plans have been removed from certain institutions. The professions must be alert to the danger which lies in the several prepayment plans which have been sponsored by several government agencies. The mechanism of the Medical Service Bureau makes it possible to offset the substitute plans as a stop-gap service.

The Resettlement Administration has endeavored to secure a foothold, and the Farm Credit Administration has attempted the same thing; nevertheless it is now obvious that the professions have established a service to fill this requirement of government employees.

Some figures assembled by Dr. Virgil Loeb and the number of patients handled by the Medical-Dental Service Bureau in eleven months are interesting in connection with a survey of this plan.

| | |
|---|---|
| Number of patients handled by Medical-Dental Service Bureau (in 11 months) | 767 |
| Amount of payments (over) | $67,000 |
| Number of patients budgeting old bills | 230 |
| Number of patients budgeting new bills | 537 |
| /Cases pending | 64 |
| Number of city physicians using bureau | 224 or 22.4% |
| Percentage of county physicians using bureau | 31.7% |
| Percentage of hospitals using bureau | 82% |
| Number of dentists using bureau | 94 |
| Percentage of dentists using bureau | 14% |
| Average amount of physician's bill | $70.00 |
| Average amount of dentist's bill | $47.00 |
| Average amount of hospital bill | $64.00 |

There is now an opportunity for the professions to originate a plan which will set the pattern and which will be workable and will be satisfactory to them. The outline of the above plan, known as the Washington plan, now being operated successfully in St. Louis and other cities is being watched with a great deal of interest.

*H. C. P.*

# News and Notes

## American Society of Orthodontists

The thirty-fifth annual meeting of the American Society of Orthodontists will be held at the Edgewater Beach Hotel, Chicago, April 19-22, 1937.

PAUL G. SPENCER, President
1817 Austin Avenue
Waco, Texas

CLAUDE R. WOOD, Secretary
608 Medical Arts Bldg.
Knoxville, Tenn.

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## Southern Society of Orthodontists

The fifteenth annual meeting of the Southern Society of Orthodontists will be held at the Atlanta Biltmore Hotel, Atlanta, Ga., on January 25, 26, and 27, 1937. All ethical members of the dental and medical professions are cordially invited.

WILLIAM A. CLARK, President
Medical Arts Bldg.
Atlanta, Ga.

WILLIAM P. WOOD, JR., Secretary
442 West Lafayette Street
Tampa, Fla.

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## European Orthodontological Society

The next meeting of the European Orthodontological Society will be held in Brussels on May 17 and 18, 1937, under the presidency of Dr. Lucien De Coster. The Headquarters will be at the Palace Hotel. The scientific meetings will be held in the new Eastman Clinic buildings, by courtesy of Dr. Watry.

Communications from those who desire to contribute to the program may be addressed to

G. F. CALE-MATTHEWS, Hon. Secretary
95, Newhall Street
Birmingham, 3, England

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## North St. Louis Dental Society

The Eighth Annual Meeting will be held at the Chase Hotel, January 27 and 28, 1937.

A. C. MOGLER
4482 Washington Blvd.
St. Louis, Mo.

## American Board of Orthodontia

A meeting of the American Board of Orthodontia will be held at the Edgewater Beach Hotel, Chicago, April 17, 1937. Orthodontists who desire to qualify for certificates from the Board should secure the necessary application blank from the secretary. The application must be returned to the secretary, together with any other required credentials, at least sixty days prior to the date of examination. Applications filed at the time of the Board meeting will have preliminary consideration, so that the applicant may be advised of the work required for his subsequent examination. Attention is called to the following resolutions adopted by the Board:

Any person desiring to make application to the Board for a certificate must have been in the exclusive practice of orthodontia for a period of not less than five years or an equivalent to be determined by the Board and based upon the following conditions:

1. He must be an instructor in orthodontia in a school satisfactory to the Board.

2. He must be an associate in the office of an orthodontist whose standing is satisfactory to the Board.

3. It is definitely to be understood that any person at the time of making application for a certificate shall be in the exclusive practice of orthodontia in his own name.

CHARLES R. BAKER, Secretary,
636 Church Street,
Evanston, Ill.

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## Southwestern Society of Orthodontists

The sixteenth annual meeting of the Southwestern Society of Orthodontists will be held at Shreveport, Louisiana, January 18-20, 1937.

A cordial invitation is extended to all members of the American Society of Orthodontists to attend these sessions. Among the clinicians will be Oren A. Oliver, Wm. R. Humphrey, S. D. Gore, and E. B. Arnold.

CURTIS W. WILLIAMS, President,
Medical Arts Building,
Shreveport, La.

HARRY H. SORRELS, Secretary,
Medical Arts Building,
Oklahoma City, Okla.

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## Notes of Interest

Dr. Ray W. Noland and Dr. James S. Hoffer announce that they are now associated in the exclusive practice of orthodontia. Offices in the Equitable Building, Des Moines, Iowa.

Dr. Earl F. Lussier announces that his brother Dr. Ray A. Lussier will be associated with him in the practice of orthodontics. Offices at 450 Sutter Building, San Francisco, and San Mateo Dental Guild Building, San Mateo, Calif.

Dr. A. C. Mogler announces the removal of his office from 4482 Washington Boulevard to the Pasteur Building, St. Louis, Mo. Practice limited to orthodontia.

Dr. Paul L. Cleaves announces the opening of his office at 333 Bridge Street, Springfield, Mass. Practice limited to orthodontia.

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